KALMIOPSIS

Journal of the Native Plant Society of Oregon

Green-tinged Paintbrush (*Castilleja chlorotica*)

ISSN 1055-419X

Volume 14, 2007

KALMIOPSIS

Journal of the Native Plant Society of Oregon, ©2007

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EDITORIAL

This year I have been particularly delighted with manuscripts submitted for publication in *Kalmiopsis*. Not only do I have more than we can publish this year, but the articles encompass a wide range of geographic regions. Starting in northeastern Oregon, Gene Yates writes of the wonderful *Mirabilis macfarlanei* and the people who discovered it in Hells Canyon of the Snake River. Rhoda Love tells us the inspiring story of William Cusick who continued to botanize after losing both hearing and sight. Moving south in eastern Oregon, Ron Larson shares one of his favorite haunts for the Oregon Plants and Places series: Gearhart Mountain Wilderness. John Leiberg collected green-tinged paintbrush, which graces our cover, on the slopes of Gearhart Mountain in 1896. Finally, in an article that spans much of western Oregon, Molly Sultany, Susan Kephart and Peter Eilers use two camas species to explore the ecological and cultural connection between native plants and peoples, and its relevance to conservation. Don't forget to read the inspiring stories about our new fellows. NPSO honors five women who fell in love with the native flora of the part of Oregon they called home and, through volunteering countless hours in education and conservation, found their lives enriched with friendship and purpose.

A white oak savanna and prairie in Salem, Oregon that provides habitat for both *Camassia quamash* subsp. *maxima* (left inset) and *C. leichtlinii* (right inset). Photos by George Benson, Sue Carlson, and Susan Kephart.

Mirabilis macfarlanei flowers, photo by Gene Yates, in Hells Canyon, May 2007.

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COVER PHOTO: Green-tinged Paintbrush (*Castilleja chlorotica*). Photo by Ron Larson at Gearhart Peak, Oregon, July 24, 2004.

Kalmiopsis: ISSN 1055-419X. Volume 14, 2007. Published annually. Subscription $18 per year.
Native Plant Society of Oregon
General business address: PO Box 902, Eugene, OR 97440-0902

MacFarlane's Four-O'clock in Hells Canyon of the Snake River

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Robust specimen of *Mirabilis macfarlanei*. Photo by Gene Yates.

MacFarlane's four-o'clock (*Mirabilis macfarlanei* Constance and Rollins), a rare, beautiful perennial, is narrowly endemic to a small range (46 by 29 km) in northeastern Oregon and adjacent west central Idaho. Many species in the genus *Mirabilis* are called four-o'clocks because their flowers open during late afternoon. *Mirabilis macfarlanei* is an exception to this pattern. Its rarity and geographic isolation may have selected for flowers open throughout the day and other adaptations that set it apart from other four-o'clocks.

Endangered Status

Mirabilis macfarlanei, currently listed as threatened under the Endangered Species Act (ESA), was first listed in 1979 as endangered, a more dire status, when only three populations totaling 20 to 25 plants were known. These populations were threatened by several factors: trampling, collecting, livestock grazing, disease and insect damage (USFWS 2000). Since then, the Idaho Conservation Data Center, US Fish and Wildlife Service (USFWS), Bureau of Land Management (BLM) and Forest Service have jointly conducted inventories in the range of the four-o'clock and discovered several additional populations harboring thousands of plants. Many of these new discoveries are located on lands managed by the BLM and Forest Service.

Currently, there are eleven known populations: six in the Salmon River canyon, three in the Hells Canyon of the Snake River, and two in the lower Imnaha River canyon. One Hells Canyon population is quite large, with hundreds plants growing in eight distinct patches. Of the four populations in Oregon, three are on federal lands within the Hells Canyon National Recreation Area. The fourth site is privately owned within the Recreation Area. In Idaho, almost half of the *M. macfarlanei*

populations grow on Forest Service or BLM administered lands; the remainder are on private land. This is worth noting because, in contrast to animal species, the ESA does not mandate protection of threatened or endangered plants growing on privately owned lands. Conservation measures undertaken by private landholders are wholly voluntary. The discovery of additional populations, plus conservation actions instituted on Forest Service and BLM sites, prompted the USFWS in 1996 to reclassify *M. macfarlanei* from endangered to threatened status.

Brief Description and Life History

Mirabilis macfarlanei grows in long-lived colonies, with herbaceous stems that emerge from a deep-seated, tuberous-thickened rhizome to form hemispheric clumps up to 1 m broad. Rarely, clumps reach a full meter in height. The broadly obtuse to ovate leaves are somewhat succulent, deep green above, glaucescent below, entire, 2.5 to 7.5 cm long, and about as wide, and progressively reduced and relatively narrower up the stem. A member of the family Nyctaginaceae, *M. macfarlanei* has a hypogynous flower (ovary superior) that lacks a corolla. The petaloid calyx, however, is strikingly showy: five sepals united into a brilliant rose-magenta funnel 1.5 to 2.5 cm long with a 1 to 3 cm broad limb. The stamens are slightly exserted, and the style extends 4 to 5 mm farther, positioning the stigma well beyond the reach of the anthers. Involucrate clusters of 4 to 7 flowers are borne in the axils of upper leaves.[1] Each flower produces one fruit, a 6 to 9 mm ellipsoid achene

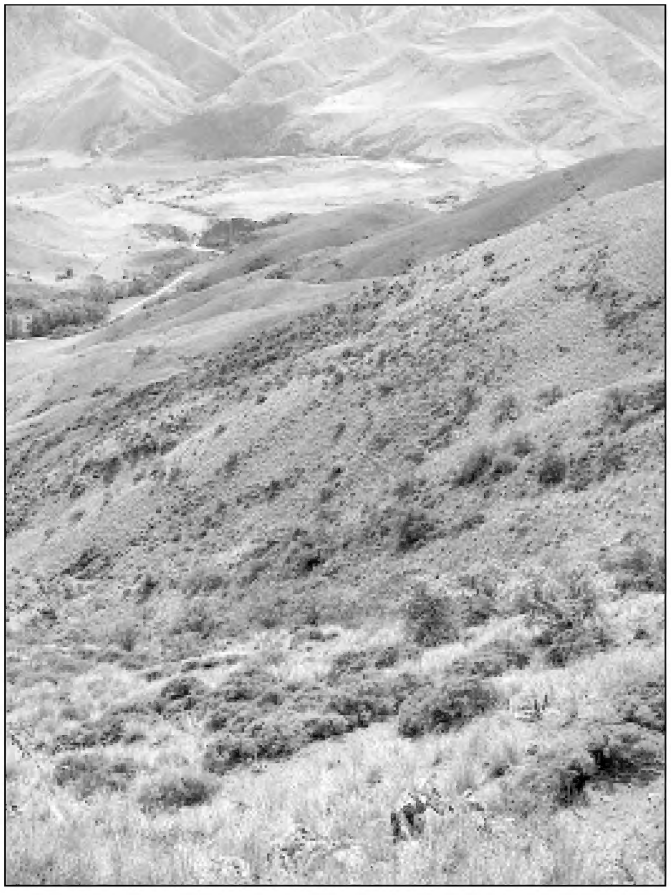
The name *Mirabilis* comes from Latin meaning wonderful, a reference to the showy flowers that typify this genus. Large specimens in full bloom are indeed wonderful: broad, thigh-deep mounds of emerald green emblazoned with hundreds of brilliant magenta flowers. The specific epithet acknowledges Ed MacFarlane, the Snake River boat pilot who pointed out the plant to Lincoln Constance and Reed Rollins (see sidebar on page 5).

Around late March herbaceous stems emerge from the ground (Lowry pers. comm.). Flowering begins in mid-May and may continue until early June. The onset and duration of the bloom can vary by as much as one or two weeks. Annual variation in floral phenology is likely related to variations in temperature and precipitation, with warm, damp springs resulting in earlier flowering (Kaye and Meinke 1992). Within each cluster, flowers open sequentially and each remains open for only one day, so that each inflorescence usually displays only one, or occasionally two, open flowers at a time (Barnes 1996).

Habitat

Mirabilis macfarlanei inhabits the warm, dry canyon grasslands of the Snake, Salmon, and Imnaha Rivers on slopes between 300 and 900 meters elevation. Less than 305 mm of precipitation fall annually in these arid locales (Tisdale 1986). Habitat and associated species vary among populations. The beautiful fuzzy-tongue penstemon (*Penstemon eriantherus* var. *redactus*) is a faithful companion at most sites. Many *M. macfarlanei* sites are dominated by bluebunch wheatgrass (*Pseudoroegneria spicata*), although sparse, compared to the lush cover in stands of bluebunch wheatgrass found elsewhere in Hells Canyon. The more arid sites support strict buckwheat (*Eriogonum strictum* var. *proliferum*), hoary chaenactis (*Chaenactis douglasii* var. *glandulosa*) and prickly-pear cactus (*Opuntia polyacantha*). Two warm season grasses, sand dropseed (*Sporobolus cryptandrus*) and red three-awn (*Aristida purpurea var. longiseta*) accompany a few populations of *M. macfarlanei* at lower elevations. An unusual habitat is the one in which *M. macfarlanei* grows under and around a canopy of smooth sumac (*Rhus glabra*). The highest elevation population grows in a community of greenbush (*Glossopetalon spinescens var. aridum*), curl-leaf mountain mahogany (*Cercocarpus ledifolius*), sparse bluebunch wheatgrass and Oregon twinpod (*Physaria oregana*) on a steep southerly slope of sand, gravels and scree derived from Triassic age mudstone. Two infrequent associates include a brilliant yellow form of the clustered broom-rape (*Orobanche fasciculata*) and pallid milkvetch (*Asclepias cryptoceras*).

Bluebunch wheatgrass (*Pseudoroegneria spicata*) dominates plant cover at this *Mirabilis macfarlanei* site (scarcely visible as darker texture at lower right). Nearly all the *Mirabilis* growing at this ecologically vibrant site is obscured by the grass. Photo by Gene Yates.



Mirabilis macfarlanei habitat (in foreground) on steep southerly slope with bluebunch wheatgrass (*Pseudoroegneria spicata*), spiny green bush (*Glossopetalon spinescens* var. *aridum*) and curl-leaf mountain mahogany (*Cercocarpus ledifolius*). Photo by Gene Yates.

Biogeography

Mirabilis macfarlanei is widely distanced from its two closest relatives, *M. multiflora* var. *glandulosa* (growing 480 km to the south in Nevada) and *M. greenei*, (560 km southwest in California). During a past warmer climate, prior to the Pleistocene, *M. macfarlanei* may have been more widespread. With the onset of climatic cooling and a southward migration of most North American *Mirabilis*, *M. macfarlanei*, or its progenitor, likely found a refuge in the warm, dry canyons of the Snake and Salmon Rivers (Barnes 1996). The climate and environmental conditions at lower elevation in these canyons are similar to the environment where its related congeners (its fellow four-o'clocks) are found, and contrast sharply with conditions in the surrounding mountainous terrain. Canyon grasslands are characterized by a mild winter climate with hot, dry summers that rank among the longest growing seasons in the intermountain West (Johnson 1984). Other examples of disjunct southern xerothermic plants in Hells Canyon are netleaf hackberry (*Celtis reticulata*), spiny green-bush (*Glossopetalon spinescens* var. *aridum*) and smooth sumac (*Rhus glabra*). And, though neither disjunct nor endemic to this region, prickly-pear cactus (*Opuntia polyacantha*) is abundant in the lower elevations Hells Canyon, another acute reminder of this hot, arid climate

In addition, populations of *Mirabilis macfarlanei* in the three major drainages of the Snake, Salmon and Imnaha Rivers are more or less disjunct from each other. Jennifer Barnes (1996) studied genetic differences among the populations. Generally, *M. macfarlanei* exhibits low genetic diversity among populations, but Barnes found that genetic differentiation increased with distance between populations. As expected, populations in a given river canyon, e.g., the Salmon River, are more closely related to one another than to populations in either the Snake or Imnaha Rivers. The Imnaha River populations appear to have been isolated first; the Snake and Salmon River populations appear to have separated more recently. Currently little gene flow is evident between populations; thus isolation and small population size may be perpetuating low levels of genetic diversity.

Population Biology

Mirabilis macfarlanei forms colonies that grow from extensive lateral roots that produce thick tubers that are usually from 4 to 8 cm in diameter by 25 to 35 cm long. One large specimen was 13 cm in diameter and 43 cm long. Roots are about 1 to 1.5 cm in diameter (Lowry pers. comm.). They are usually shorter than 2 m, but can extend to 10 m. Barnes (1996) mapped *M. macfarlanei* clones at

Mirabilis macfarlanei growing with prickly pear cactus (*Opuntia polyacantha*), bluebunch wheatgrass (*Pseudoroegneria spicata*) and yarrow (*Achillea millefolium*). Photo by Gene Yates.

three sites from the Imnaha and Snake River populations and found an average of about five ramets (individual stems) per clone (genet). Mapping of three Salmon River populations produced quite different results: first, several genets had only one ramet (plants with no apparent vegetative spread); second, there was more variation between populations in the number of ramets per genet. Because the number of ramets varies from year to year, presumably in response to environmental factors (especially precipitation), Barnes *et al.* (1997) cautioned against the use of ramet counts to estimate population size.

Most populations, except the smallest, contain several genotypes. Vegetative spread has produced some colonies with intermixed growth patterns where lateral roots from different genets have grown amongst one another. Other colonies displayed less interclonal mixing; genet clumps were more or less separate. Barnes (1996) hypothesized that the colonial habit of *M. macfarlanei* would increase the amount of inbreeding, but her studies at one population found a high degree of outcrossing; slightly more than half the seeds were cross-pollinated. Because most populations comprise several genotypes, new plants have obviously been recruited via seed, but apparently quite slowly. This assumption is supported by a monitoring study by Kaye and Meinke (1992) who reported that seedlings were rare and did not survive long; 88% of seedlings died by their second year.

Pollination

Four-o'clocks are thus named because of their penchant to flower in the late afternoon. The flowers of *M. multiflora*, a close relative from the desert southwest, open at dusk then close after sunup or shortly thereafter. In contrast, Barnes (1986) recorded that *Mirabilis macfarlanei* flowers open throughout the day for various durations. The greatest number of flowers opened during the late afternoon period (1500 to 1900) and the fewest during the early morning (0700 to 1100). Flowers that opened during late afternoon and at night tended to remain open longer, up to a full day, whereas flowers that opened in the morning frequently closed within eight hours. The net result was that the number of open flowers per plant did not vary significantly over a 24-hr period.

This finding has interesting implications for the pollination biology of *Mirabilis macfarlanei*. *Mirabilis multiflora*, like many *Mirabilis* species, is adapted for nocturnal pollination (Cruden 1973). The flowers open in late in the day and emit a musk-like odor that, in one study, attracted hawkmoths within ten minutes (Cruden 1970). In contrast, Baker (1983), using only black light (no musk), failed to attract hawkmoths or other large moths overnight at one Salmon River *M. macfarlanei* population, nor did he observe moths of any kind visiting the *Mirabilis* flowers for pollination. The most frequent visitors and presumed pollinators of *M. macfarlanei* are long-tongued bees of the genera *Bombus* and *Anthophora* (Baker 1985, Barnes 1996); both were present throughout the day and were active earlier and later than other floral visitors. Barnes attributes this reliance on generalist pollinators (bees) rather than specialist pollinators (hawkmoths) to the rarity of *M. macfarlanei*.

Another noteworthy difference in *M. macfarlanei* pollination biology is its ability to self-fertilize. *Mirabilis multiflora* and *M. greenei* are both obligate outcrossing species (Pilz 1978, Levin 2000); their flowers must receive pollen from genetically different plants to produce viable seed. *Mirabilis macfarlanei* appears to be self-compatible, given the presence of pollinators, e.g., bees (Barnes 1996).

Closeup of the micro-lepidopteran *Lithariapteryx abroniaeella* on *Mirabilis macfarlanei* leaf. Photo by Gene Yates.

Pests

Although the habitat of some *M. macfarlanei* populations appears to be in excellent ecological condition, exotic invasive plants, especially cheatgrass (*Bromus tectorum*), have invaded several sites. Dalmatian toadflax (*Linaria dalmatica*) has invaded one population in Hells Canyon and Scotch thistle (*Onopordum acanthium*) is present at one site in the Imnaha River canyon. Yellow starthistle (*Centaurea solstitialis*), and rush skeleton-weed (*Chondrilla juncea*) lurk perilously close to several other four-o'clock sites in Hells Canyon.

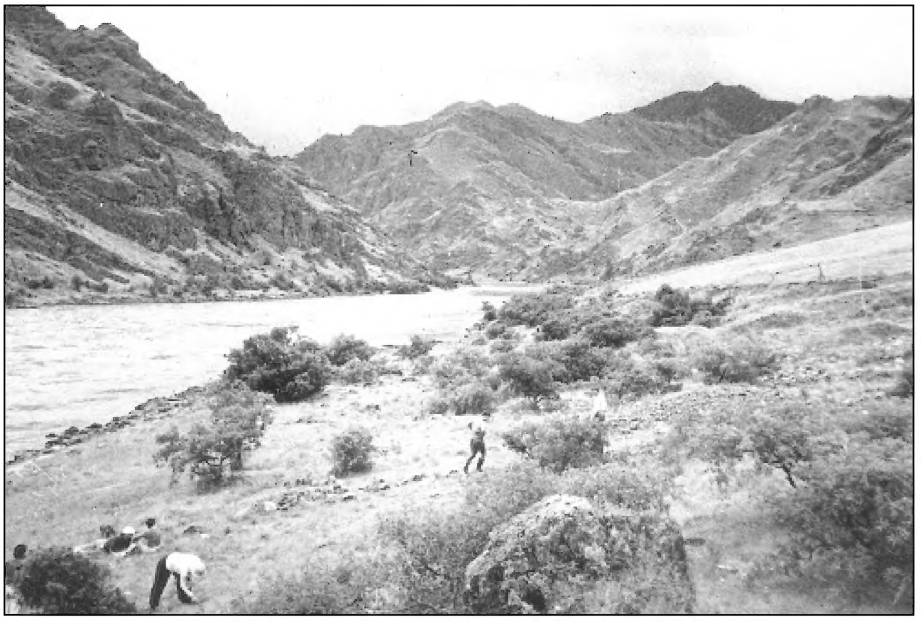
Spittle bugs of the genera *Aphrophora* and *Philaenus* are natural pests of *M. macfarlanei*. Their nymphs feed on the shoots and inflorescences of the four-o'clock. Charles Baker (1983) found these insects so prevalent on some plants that emergent stems died back to the ground, while "stunting and general unthriftiness" accompanied other plants encumbered with "sizable" infestations. Spittle bug numbers fluctuate annually and

Larvae of the micro-lepidopteran *Lithariapteryx abroniaeella* feed between the upper and lower epidermis creating a transluscent "window" in the *Mirabilis* leaf.

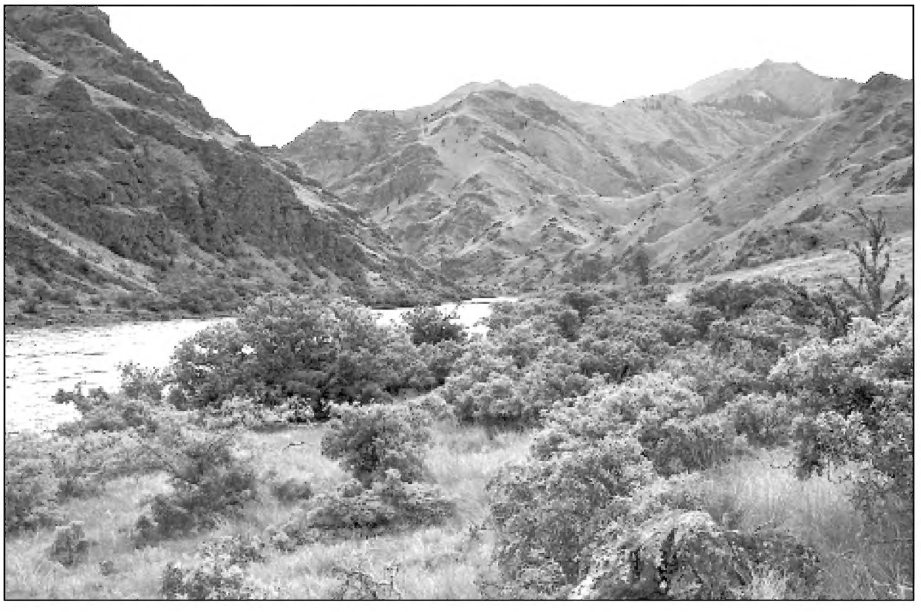
Discovery and naming of *Mirabilis macfarlanei*

Mirabilis macfarlanei was first collected and described by Lincoln Constance and Reed Rollins in 1936. Many students and scholars of botany are well aware of Constance and Rollins' contributions to the flora of North America. Lincoln Constance was a noted scholar of the Umbelliferae (Apiaceae) and patriarch of botany at UC Berkeley. Reed Rollins contributed many studies of the Brassicaceae (Cruciferae) during his long tenure as Director of the Gray Herbarium at Harvard University. Lincoln Constance's first position following completion of his PhD from Berkeley under the direction of Jepson was at Washington State College in Pullman. His first graduate student was Reed Rollins. In their two years together, these botanists investigated and collected plants from throughout this portion of the west, but to Constance (1982) their most notable trip was the "annual Spring-vacation mass foray by motor launch through dangerous white water to the bottom of mile-deep Hell's Canyon of the Snake River."

Their trusted riverboat captain on these excursions was Ed MacFarlane, who pioneered the era of commercial boat transport in Hells Canyon and is remembered as the "Father of Snake River navigation" (Carrey *et al.* 1979). In the early 1900's, MacFarlane owned a hardware store in Asotin, Washington, just north of the Oregon border along the Snake River. The stories and accounts he heard from the growing population of miners and homesteaders in need of river transport prompted the enterprising and water-oriented MacFarlane to build a boat and go into business. He launched his first vessel in 1910 and for 30 years, through a variety of partnerships and ventures, ferried supplies, goods, livestock, homesteaders, miners, mail and tourists (not to mention adventurous botanists) on the Snake River from Lewiston, Idaho, and points upstream in Hells Canyon.



"We collect type of our *Mirabilis*" Lincoln Constance noted below this photograph from his album of the May 1936 excursion up the Snake River. Used with permission, Lincoln Constance estate.



The same view where Constance and Rollins collected the type, 69 years later. Note the increase in *Celtis reticulata* cover. Most *Mirabilis* is upslope out of the picture on the right. Photo by Gene Yates.

Ed MacFarlane overlooking the Snake River during the climb to collect *Arabis crucisetosa*. MacFarlane was 64 years old. Used with permission, Lincoln Constance estate.

Mirabilis macfarlanei population growing on Bonneville flood deposits (ca. 14,500 ya). Bluebunch wheatgrass (*Pseudoroegneria spicata*) is sparse and cheatgrass (*Bromus tectorum*) is prevalent. Photo by Gene Yates.

among populations, and in some years they noticeably reduce flowering and seed production.

Another natural pest of *M. macfarlanei* is the leaf-mining micro-lepidopteran (small moth), *Lithariapterx*, whose larvae feed on the succulent palisade between leaf epidermal layers and floral buds. Charles Baker, the entomologist who collected the larvae from *M. macfarlanei* and reared them to adults, initially speculated this moth might represent a previously undescribed species that is host-specific to *Mirabilis macfarlanei* (Baker 1983, 1985). However, it was later identified as a more widespread species from the southwest, *Lithariapteryx abroniaeella*. In a review of *Lithariapteryx*, Powell (1991) assigned the insects that "Baker reared from *M. macfarlanei* in Idaho" to *L. abroniaeella*. Hsu and Powell's monograph of the Heliodinidae (2004) retained this assignment. *Lithariapteryx abroniaeella* is not known to pollinate or otherwise benefit *M. macfarlanei*.

Conservation

Livestock grazing and invasion by exotic plants were identified as the two greatest threats facing the species (USFWS 2000). Others threats included off-road vehicle impacts, pedestrian trampling, herbicide use, and road and trail construction. To date, several conservation actions are facilitating recovery of the four-o'clock. The Wallowa-Whitman National Forest excluded grazing with fences around some populations in Hells Canyon and the single Forest Service administered site in the Imnaha River canyon. On the Idaho side of Hells Canyon, the Forest Service has temporarily discontinued livestock grazing in the allotment where *M. macfarlanei* grows. The Oregon side of Hells Canyon is no longer grazed. In the Salmon River, the BLM has fenced one site previously accessible to livestock; other BLM sites are so steep that livestock do not frequent them (Lowry pers. comm.).

The Oregon Department of Agriculture released a biological control insect on Dalmatian toadflax at one four-o'clock location in Hells Canyon and the Forest Service continues to control weeds in the vicinity of other four-o'clock sites in Hells Canyon.

The Berry Botanic Garden, in coordination with the Forest Service, BLM, and USFWS, has collected and placed into long-term cold storage thousands of *M. macfarlanei* seeds from throughout its range. The Berry Botanic Garden has also conducted propagation experiments on *M. macfarlanei* and is currently partnered with the Forest Service to establish *Mirabilis macfarlanei* in suitable habitat in Hells Canyon.

These conservation efforts, plus the fact that most *Mirabilis macfarlanei* populations occur on federal lands, greatly improve the prospects for survival of this threatened species.

[1]In the classic *Mirabilis* subgenus *Quamoclidion* inflorescence, a solitary, ebracteate, central flower is surrounded by 5 flowers borne on the bases of their fused involucral bracts (Pilz 1978). Reported variations from this pattern are likely due to floral abortion and herbivory, which are well documented in *M. macfarlanei* (Baker 1983, Kaye and Meinke 1992, Barnes 1996).

Hiking in Hells Canyon

The month of May is a wonderful time to visit Hells Canyon. The weather is not hot and the sharp-tipped awns in cheatgrass (*Bromus tectorum*) florets haven't yet cured to the point where they become an unbearable pestilence in footwear and socks. The third or fourth week of may is a great time to catch the four-o'clock in flower, and many of the plants listed here also bloom in May. If conditions are right, the end of flowering for the four-o'clock will coincide with the beginning of the prickly-pear cactus bloom. I caution visitors about the prevalence of rattlesnakes. I encounter rattlesnakes with each visit, though I find them neither a threat nor a bother. Definitely watch out for western poison ivy (*Toxicodendron rydbergii*), common along the lower slopes and bottoms of the Snake River in Hells Canyon and its tributaries.

Plants Endemic to Hells Canyon

Arabis crucisetosa Constance and Rollins (collected during same trip with *M. macfarlanei*)
Arabis hastatula Greene
Astragalus arthurii M.E. Jones
Astragalus vallaris M.E. Jones
Calochortus macrocarpus Dougl. var. *maculosus* (A. Nels. & J.F. Macbr.) A. Nels. & J.F. Macbr.
Calochortus nitidus Douglas
Lomatium rollinsii Mathias and Constance
Lomatium serpentinum (M.E. Jones) Mathias
Mimulus hymenophyllus R.J. Meinke
Phlox colubrina Wherry and Constance
Ribes cereum Dougl. var. *colubrinum* C.L. Hitchc.
Rubus bartonianus M.E. Peck

Acknowledgements

I extend sincere thanks to Dr. Barbara Ertter who digitized images from Lincoln Constance's scrapbooks of his Snake River excursions and to the Estate of Lincoln Constance, William Constance, Executor, for willingly permitting use of these images. Gina Glenne of the US Fish and Wildlife Service helped sleuth the fate of the Charles Baker *Lithariapteryx* collection. Forest Service botanists Jerold Hustafa and Marty Stein shared their observations of *Mirabilis macfarlanei*. Mark Lowry, BLM botanist, provided extensive information regarding Salmon River *M. macfarlanei* populations. This article relied heavily on the research of Jennifer Barnes, whose MS thesis is perhaps the most comprehensive and exhaustive look into *M. macfarlanei* biology to date. Finally, I would like to recognize Roy Lombardo, Forest Service River Ranger, who has shared his extensive knowledge of Hells Canyon and safely transported me during the past six seasons on the Snake River.

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Gene Yates has worked 17 years as a botanist for the US Forest Service. Most of his career has been spent in the Blue Mountains of northeast Oregon where he is currently employed as the forest botanist for the Wallowa-Whitman National Forest in Baker City. In his spare time (when not ferrying his unlicensed teenagers to-and-fro) he enjoys fly-fishing, gardening and, especially, bonsai using northwest native plants. And despite the poison ivy, he adores Hells Canyon.

Pioneer Botanist William Cusick: His Dark and Silent World

Rhoda M. Love
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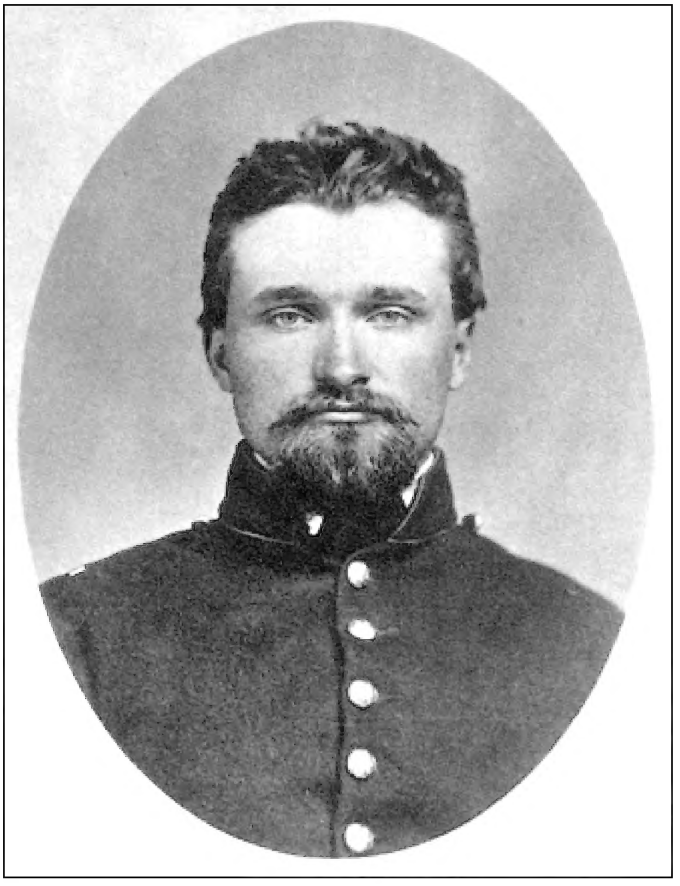
(Adapted from an essay that will appear in Plant Hunters of the Pacific Northwest, edited by A.R. Kruckeberg and R.M. Love)

Botanist William Conklin Cusick (1842-1922) was a pioneer in every sense of the word. As an eleven-year-old lad in 1853 he walked across the plains with a covered wagon train from Illinois to Oregon's Willamette Valley. In 1872, when he was thirty, William and his younger brother Frank became two of the earliest settlers of the Powder River Valley in eastern Oregon. Beginning at that time, and for four decades until overcome by nearly total deafness and blindness, Cusick undertook the pioneering botanical explorations of the remote Wallowa and Blue Mountain ranges in the extreme northeast corner of our state.



William Conklin Cusick at about age 23 when he joined the Union Army and was stationed at Lapwai, Idaho. A.R. Sweetser Papers, Ax 75, Special Collections and University Archives, University of Oregon Libraries.

Crossing the Plains

William Cusick was the oldest child of Robert G. and Sarah H. Cusick, people of Scotch-Irish ancestry whose forebears immigrated to this country shortly after the Revolutionary War. At the age of eleven he traveled west by covered wagon from Illinois with his parents, siblings, uncle, aunt, cousins and an 82-year-old grandmother; as the oldest boy in the pioneer party, William drove the oxen during the six-month journey. Arriving in western Oregon in October 1853, the Cusicks settled in the Willamette Valley near the town of Kingston, Linn County, where William's father took up a 320-acre claim. William had a keen memory of the westward journey and especially its flowers. He later recalled a beautiful pale purple sego lily: "We got to the south pass of the Rocky Mountains, which was then the eastern line of Oregon, on the 4th of July. I remember seeing *Calochortus nuttallii* growing among the sage brush in the valley of the Snake River" (St. John 1923).

For a farmer's son of those times, William received a good education. From age four to eleven he attended a country school in Illinois, and when the family settled in Oregon he continued his public school studies. As a lover of plants, he no doubt enjoyed his walks to the local schoolhouse through the tall grasses and native wildflowers of Kingston Prairie. At age 20 he transferred to the now extinct school of La Creole Academy at Dallas, Polk County. After graduation, he taught school for two years and then, in 1864-65, attended Willamette University in Salem where he studied math, algebra, physics, and geology (St. John 1923, Lange 1956). Although he received no formal training in the study of plants, his knowledge of geology was no doubt a help to him during his later botanizing.

Army Life

In December 1864, near the end of the Civil War, 22-year-old William joined the Union Army as a volunteer. However, he was not sent to battles in the east, but instead spent periods in army camps in western Idaho and eastern Oregon. His rank was Sergeant in the 1st Oregon Infantry, and he was originally assigned to the Quartermaster Corps at Lapwai, Idaho, where it was the duty of the Infantry to keep an eye on the Nez Perce Indians. However, the Native people remained quiet and Cusick had time on his hands, so he sent to Portland for Harvard Professor Asa Gray's *First Lessons in Botany* and, as he said, "…studied it pretty carefully one winter." He also stated years later, "I was interested in plants as early in life as I can remember but I had no book on botany until I was 22 years old, a soldier in the US Volunteer Service" (Lange 1956). Cusick was discharged from the Army in 1866; but his service made him eligible for a Government pension which was helpful to him throughout his life. After his discharge, he settled near Salem and returned to

teaching. However, at the early age of 24, his hearing began to fail and he was forced to abandon his profession.

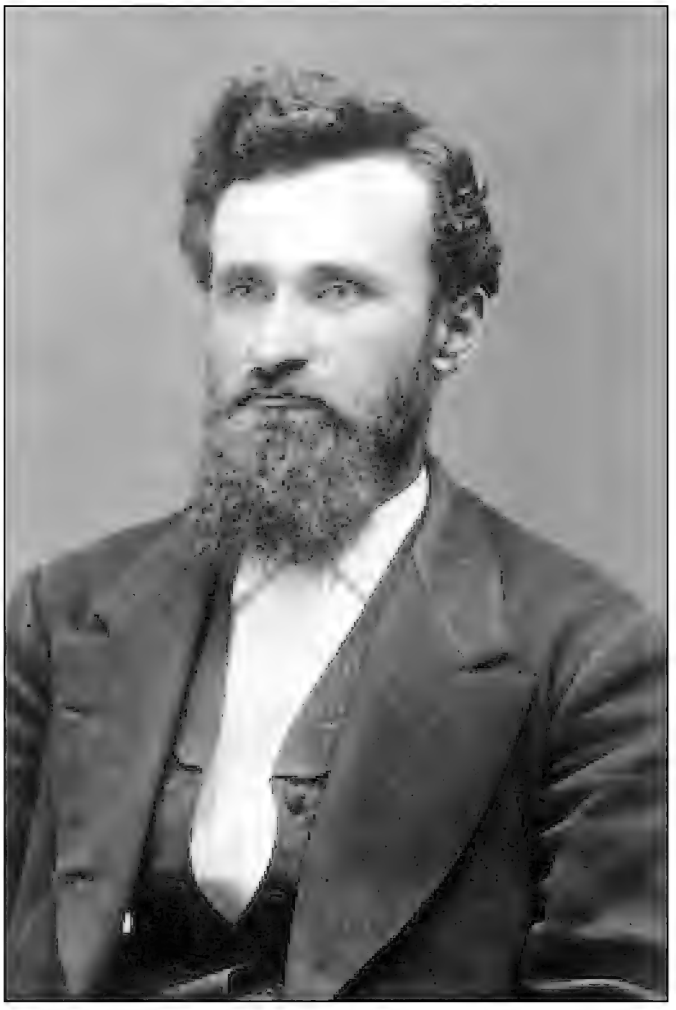
The Powder River Ranch and Early Botanizing

Unable to teach, William moved to the Powder River Valley in eastern Oregon with his younger brother Samuel Franklin (Frank) in 1872. The brothers (30 and 25 years old, respectively) took up adjoining homesteads on Cusick Creek in Thief Valley of Baker County. Although the exact location of the Cusick property has not been verified, their homesteads may now lie beneath the waters of Thief Valley Reservoir. This region of rolling sagebrush-covered hills has a view of Elkhorn Ridge in the Blue Mountains to the southwest. Together the brothers cleared the land of brush and constructed log buildings. Local settlers began small-scale irrigation projects along the Powder River; however, the river's flow often dwindled to little more than a trickle by midsummer.

For a number of years, although William may have noticed the nearby wildflowers, he was no doubt too busy with ranch work to think about botany. This changed the day he chanced to meet Dr. Reuben D. Nevius, the wandering minister-botanist for whom the genus *Neviusia* (Rosaceae) is named (St. John 1923). Nevius founded churches in Baker City, Union, and LaGrande between 1873 and 1875 (Powers and Nelson 2001). The minister taught William various botanical techniques, including how to collect a scientifically useful specimen, how to keep records, and where to send specimens for identification. More importantly, Nevius almost certainly told Cusick that money could be made by selling pressed plants to eastern US and European herbaria and to wealthy private collectors, all of whom were eager for specimens from the unexplored regions of North America. This meeting apparently inspired Cusick, because records at the Gray Herbarium at Harvard show that he sent his first plants to world-famous botanist Asa Gray for identification in 1878, six years after moving to the ranch. That same year, Gray named *Veronica cusickii* for Cusick, the first of many species the Harvard botanist would name for the eastern Oregon collector.

When Cusick started collecting in the Blue and Wallowa Mountains, he was able to leave the ranch for only short periods. During 1879 and 1880 he collected in Baker and Union counties; his labels mention Big Creek, Catherine Creek, Trout Creek, Sparta, and the Snake River. Much later he described an early trip from the Powder River ranch to Eagle Creek meadows in the Wallowas. He left home with a saddle horse and spent two hard days collecting. He started back late the second afternoon, leading his horse loaded with "plunder," arriving at the ranch at midnight – a 50 mile walk, mostly in darkness (Eggleston papers, UO Archives).

After Cusick had been sending specimens for several years, Asa Gray must have become curious about this little-known rancher in the Powder River Valley who was finding so many new species. He apparently convinced his herbarium assistant Sereno Watson, then in his mid-sixties, to travel west to meet Cusick in November of 1880. The Cambridge botanist had some typically western adventures before finding the Powder River ranch. These were the days before the railroad came to the area, and, having reached La Grande by stagecoach, Watson hired a saddle horse and rode to the town of North Powder. On enquiring



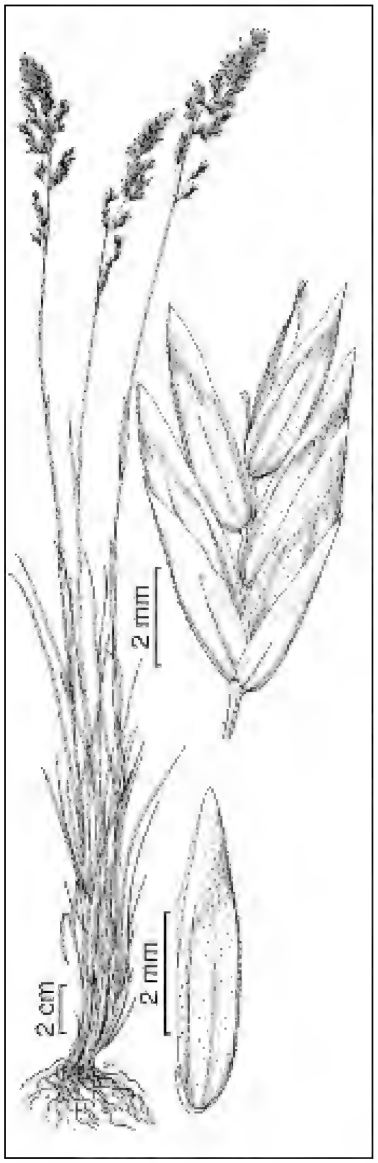
William Conklin Cusick at around age 35 when he first began sending plant specimens to Asa Gray at Harvard University. A.R. Sweetser Papers, Ax 75, Special Collections and University Archives, University of Oregon Libraries.

there, he learned that he should have turned off at the village of Telocaset. Retracing his steps he reached the small hamlet after dark. There a French woman gave him some quilts to sleep in a haystack. After a cold wet night, Watson finally found his way to the Cusick ranch in Thief Valley. By this time, Frank Cusick was married to Rebecca Ashby who apparently informed Watson that William and her husband were away in the mountains, so the weary easterner remounted, followed their trail, and eventually caught up with them there. Watson spent three days at the Cusick ranch, instructing William in the art and science of collecting, recording, and preserving botanical specimens. He also brought a gift for Cusick, a copy of his two-volume *Botany of California* by Watson, Gray and Brewer, for which the young rancher-botanist was most grateful (Eggleston papers, UO Archives).

"Everything on My Back"

Inspired by Watson's visit, Cusick began botanizing in the Blues and Wallowas whenever he could get away from the ranch for a few days. In 1881 he first visited Eagle Creek, later stating, "I went afoot and carried everything on my back" (Eggleston papers, UO Archives). He walked from Medical Springs to Cornucopia,

collecting at Sanger Mine, East Eagle Creek, Kettle Creek, and Two Color Creek, traveling east as far as the Snake River. At one point he "stayed all night at a Chinaman's cabin." As a result of this summer's collecting he was able to send over 200 specimens to the Gray Herbarium in October. However, he still had not found paying customers for his plants. The situation improved marginally when he began to correspond with Harry Patterson, an Illinois printer of botanical labels (Kibbe 1953). Patterson provided him with lists of patrons who might be willing purchase his specimens, and Cusick began to find some buyers (Lange 1956). In 1882 he botanized the Imnaha River region, and the following year he published a short note on Oregon forest fires in the *Botanical Gazette* (Cusick 1883).



Cusick's bluegrass (*Poa cusickii* subsp. *cusickii* Vasey), illustrated by Sandra Long for the *Flora of North America*. Named by the Washington DC agrostologist George Vasey, Cusick collected the type specimen in Baker County, May 1885, on "north hillsides of Powder River, near the mouth of Magpie Creek." Illustration copyrighted by Utah State University, reprinted with permission.

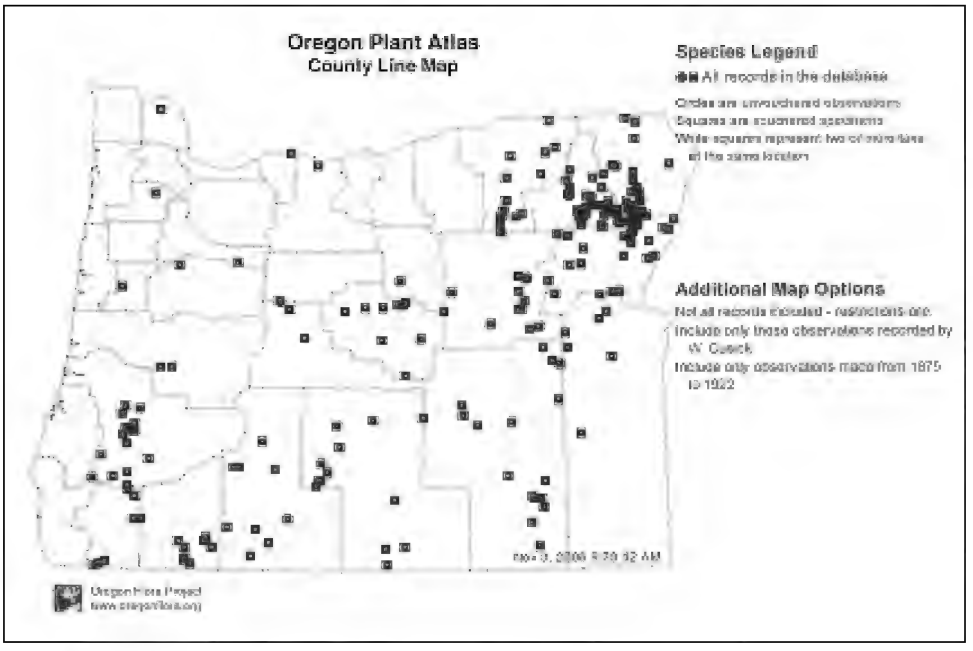
Cusick took his first botanizing trip to Steens Mountain in southeast Oregon in 1885. Arriving there, he was surprised to find that Thomas Jefferson Howell of Portland was also collecting plants in the region that summer. Later, Cusick appeared miffed that Sereno Watson identified the Howell specimens before his own, writing to Watson, "I do feel somewhat mortified that Mr. Howell got the start of me. …Of late years I have felt more anxious to make good specimens and get such as may settle doubtful points than to get those that are new and have no other merit" (Eggleston papers).

"Ponies and Presses"

In 1886 Cusick decided that finally he could botanize for a full season; perhaps he stepped out of his Powder River cabin on a sunny morning in April, gazed at the receding snows on the Elkhorns and at the wildflowers beginning to appear amid the sagebrush at his feet, and made the decision. On April 25th he wrote to Asa Gray, "I expect to put in the entire season botanizing, something I have never yet been able to do. Last fall I was taken with a severe attack of pleurisy. I still have a cough which I fear has come to stay. So I am not able to work. I shall take my ponies and presses and travel over the mountains and plains…" (Eggleston papers).

He collected that spring in the Powder River area and then as far south as Malheur County. His travels took him by Baker and Auburn, crossing Powder River at McEwen, to Whitney, down Trout Creek to Burnt River and Oxbow Trail, then to Ironside, Hereford, Auburn and back home. In the summer he botanized the Grande Ronde Valley, Cornucopia, and Hurricane Creek. Harold St. John of Washington State College reported that Cusick gathered his specimens in sets of twelve, arranging to sell his duplicates.

Cusick was a brave man to botanize the wild Wallowas alone or with only a pony. In those days, grizzly bears still roamed the mountains; the last one was killed there in 1937 (Battaile 1998), and Cusick was a deaf man. Describing these trips, St. John wrote, "Cusick never carried fire arms or fishing tackle as he felt that when unmolested the wild animals would not trouble him, and



Map of Cusick's collecting stations. Cusick has around 4,500 specimens in the OSU herbarium, thus most map dots represent a number of species. Lists of plants collected at each site can be obtained by clicking on the dots at the website (www.oregonflora.org). Courtesy of the Oregon Flora Atlas Project.

that he was too busy with his botanical collecting to waste any time in fishing. He would load his botanical outfit and camping materials on a pony and start off into the most rugged mountains, or with a team of horses and a wagon into the bleakest desert, and be gone for weeks at a time."

The Cusicks Move to Jimmy Creek

It is not known why the Cusicks decided in 1887 to give up their ranch in Thief Valley and move approximately 10 miles north. Perhaps it was the difficulty of obtaining sufficient water from the Powder River in the summer. Local farmers could expect no help from the federal government; President Grover Cleveland was known for his reluctance to aid the country's agriculturalists. Also in 1884, the railroad had come to the Powder River Valley, bringing ever more settlers and cattlemen as well as loggers who began to fell the pine forests on the slopes of the Blue Mountains. Whatever the reason, William, along with Frank and Rebecca Cusick and their three children, decided to start over, and purchased undeveloped land in Union County on Jimmy Creek near Craig Mountain. The new ranch, where they subsequently lived for nearly 30 years, was about six miles south of the town of Union. The brothers bought adjoining land; William's 120 acre plot, located in Township 5S, Range 39E, Sections 11 and 14, was said by Harold St. John to consist mostly of pastureland. The purchase price was $150.

The remains of the Cusick ranch can still be seen today. With permission from the present landowners, one can view a small log cabin, a large old barn constructed of squared-off logs, and an aboveground root cellar of good-sized stones and cement. The roofs of the cabin and barn have collapsed. Sagebrush covers the surrounding hills and large willows border Jimmy Creek and a few persist near the home site.

Husband and Father

The Cusick brothers' move to Jimmy Creek meant they had to begin again to build a homestead; thus, since William could not easily be spared to take the botanizing trips he loved, his collecting slowed for a number of years. In January of 1888 Asa Gray died in Cambridge and Sereno Watson took over the task of naming new plants collected by western botanists; Watson is known to have named at least six species for Cusick. The following year William did some collecting in the Blues near Anthony Lake, and in 1890 he published a brief note on *Ribes aureum* in the *Botanical Gazette* (Cusick 1890). Then began an episode in his life for which there is little precise information and existing records are vague and confusing.

In October 1892 William Cusick, age 50, married Mrs. Emma A. Alger, postmistress for the town of Union (St. John 1923). Sadly, Emma died only 4 months later, in February 1893 at age 43. Emma was a widow who had borne eight children (five boys and three girls), only two of whom were still living. When she died, Cusick took on responsibility for her two sons, Philip and Oscar Alger, later adopting the latter as Oscar Cusick. There is, however, a mystery here. Several existing records state Emma died a year later in 1894, but her gravestone in the Union Cemetery bears the 1893 date, and some records list the year of the marriage as 1891. Whether Emma lived for only 4 months or for 16 months after their marriage, it was surely a hard time for the family. Had Cusick fallen in love with and married the widow only to have her die unexpectedly, or had he married a friend, the already-ill Emma, in order ease her mind by taking responsibility for her orphaned sons? Cusick never wrote about this episode in his life and now, nearly 115 years later, we are unlikely to learn the truth.

Here is how Harold St. John described this period in Cusick's life: "When his wife died he was left with a mortgaged home and two children by her former marriage, Philip Alger aged 18, and Oscar aged 9 years. He supported Philip at the Oregon Agricultural College until, when nearly ready to graduate, the young man left to be married. Young Oscar Alger, he adopted as Oscar Cusick. This younger boy was also sent to college, but he too left before graduating to get married. …it was these responsibilities which kept Mr. Cusick from doing more botanical work during this period of his life." From 1892 through 1895, William did almost no botanizing other than a brief foray into the Wallowas and a bit of collecting near the town of Union. It is also possible that about this time his vision began to fail. Nonetheless, thanks to the encouragement of an enthusiastic younger botanist, William did eventually return to the work he loved.

Type specimen of Cusick's shooting star (*Dodecatheon cusickii* Greene), housed in the OSU Herbarium. Botanists have long complained about the brevity of Cusick's labels, especially his sketchy geographic information. This one reads: "1889. Pale purple. Dry (unreadable) ridges, 4,000 ft. June.

Charles Vancouver Piper and Cusick's Return to Botany

In 1896 Cusick began corresponding with 27-year-old Charles Vancouver Piper, recently hired as the botany professor at Washington State College in Pullman, who was writing a flora of the Palouse Country. Piper apparently made the first overture to Cusick and in August visited the Cusick ranch on Jimmy Creek from which the two men made a weeklong collecting foray into the Wallowas. Cusick was 54 and this was his first major botanizing trip since his marriage and Emma's death. The stimulation of meeting and corresponding with the enthusiastic Piper seems to have spurred William to resume collecting. In 1897 he botanized Malheur and Harney counties as well as the Blues and Wallowas, Logan Valley, Sumpter Valley, and the Valley of the Grande Ronde River. He visited Steens Mountain and the Alvord Valley again in 1898, traveling as far as the Santa Rosa Mountains of Nevada. Returning north, he collected in the Wallowas and along the Snake River. That year he promised Piper he would concentrate on collecting willows.

William's stepson Oscar was very ill in the spring of 1899 and Cusick cared for him at the ranch from April to July. Once the boy had recovered, the botanist explored the Seven Devils Mountains of Idaho, the Wallowas, the Snake River area, and Anthony Creek. This year and again in 1900, while collecting near Wallowa Lake and the east fork of the Wallowa River, he made collections at a site he called "Keystone Basin," a name that cannot be located on either old or recent maps of Wallowa County, leaving us with another unsolved mystery.

A New Century and New Adventures: "Lost a Horse"

The first three summers of the twentieth century were productive ones for Cusick. Starting in early May 1900, near Powder River, he visited Willow Creek, Cow Valley, and Juniper Mountain in Malheur County. By late May and June, he was in the Wallowas. On August 4, he was at Wallowa Lake; that same day he again visited the mysterious "Keystone Creek" where he collected the type of *Lomatium greenmanii*. By this time Sereno Watson had died and Cusick had begun sending many of his unidentified species to C. V. Piper in Pullman for identification. The following year, 1901, with his stepson Oscar, Cusick took one of his most ambitious trips thus far, exploring Oregon's eastern and southeastern counties. It was an astonishing itinerary for a deaf and partially blind man and a teenage boy. Traveling with a horse team and wagon, they botanized the Snake River, Malheur River, Steens Mountain, Barren Valley, Mann Lake, Alvord Valley, Harney Valley, Buck Mountain, Burns, Prineville, Logan Mountain, Black Butte, Camp Polk, Ochoco River, Silver Creek, Wagon Tire Mountains, Christmas Lake, Sycan Valley, Abert Valley, and Cow Valley. Among other difficulties on this trip, one of their horses died. William reported that they arrived home in debt.

In 1902, now 60 years old, Cusick undertook the longest collecting trip of his career. Accompanied by his brother Frank's son, George Cusick, he botanized a large area of central and southwestern Oregon. This was a remarkable sojourn. The two left the Jimmy Creek ranch on June 3 and headed south to Baker, and from there via Huckleberry Mountain to Prairie City and Dayville on the John Day River. By June 12 they were beyond Prineville heading for Black Butte. From the head of the Metolius River they traveled to Sisters, Bend, and the Deschutes River. They then moved across lava fields to Beaver Marsh, then south to the Williamson River, camping at the Klamath Indian Agency before moving on to Klamath Falls. Next they headed west across the mountains and arrived at Ashland on July 14. From there, the two moved to Grants Pass on the Rogue and then to the Applegate River. By July 24 they were botanizing on the Illinois River twelve miles from the mining settlement of Waldo. They continued south to the California border in the Siskiyous and then back to Kerby, camping near the Opera House. By August 6 they were heading back to Grant's Pass, Medford, and Ashland. One night they camped at Dead Indian Summit. Next came Butte Creek and Lake of the Woods. By August 20 they were starting for home via Fort Klamath and the Williamson River. Around September 4th they were on the way to Prineville and, from there, back to Union County via the route they had come, arriving at Jimmy Creek around September 10th. I have covered this trip in some detail as Cusick's nephew George kept a daily journal, preserved in the Eggleston papers, that provides the only truly accurate itinerary we have for one of Cusick's botanizing trips. George, however, was apparently not thrilled with the adventure; he later complained that he would not be eager to botanize with Uncle William again as he had been given no free time to fish!

Slowing Down: "Hardly a Green Thing Left"

Following the strenuous trip to the Siskiyous, Cusick did less botanizing for several years. His eyesight and hearing were growing steadily worse at this time. In 1903 he visited a niece at Whitman College and collected a few specimens along the Walla Walla River. The following year, Charles Vancouver Piper left Pullman for the Agriculture Department in Washington, DC; nevertheless, he continued his active correspondence with Cusick. William's financial situation must have been troublesome, as around this time he applied for a government job on the Wallowa Forest; however, now 63 years old, he was turned down on the basis of his age. At this time he wrote to Piper: "In a few days I hope to go for a week or so into the highest Wallowas. Have not been there for 4 or 5 years. The sheep are crowding in there now they say there is hardly a green thing left" (Eggleston papers).

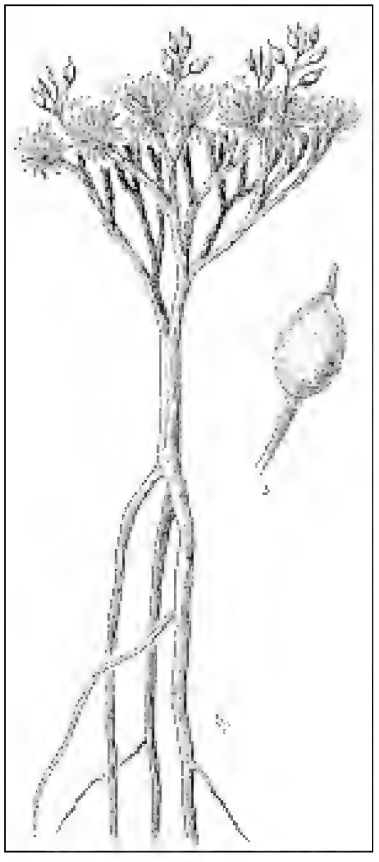
For a number of years William had been mulling over what we would today call the floristics of the part of Oregon he knew best: the Blue and Wallowa Mountains. He found himself in disagreement with geographers who often lumped the two ranges as a single unit. Both his study of geology and his intimate knowledge of plants convinced Cusick that the ranges had distinct origins and unique floras. In 1906 and 1907, he again botanized in those regions, gathering information to test his theory. At this time he wrote to Washington State College botany Professor Rolla Kent Beattie, stating that he hoped to confirm his hypothesis through a close study of his own collections as well as of those in the University of Oregon Herbarium in Eugene. During the next two years he continued to collect and explore the area gathering floristic data. In 1908 he pursued his research in the Grande Ronde Valley in June, and the Wallowas in August. During the next two years he undertook a systematic study of the western

slope of the Blues, an area where he had noted species he felt were more common west of the Cascades (Eggleston papers).

Cusick Sells His Beloved Herbarium

In 1910, at age 68, Cusick traveled to the University of Oregon Herbarium in Eugene to make good on his plan to research the differences between the floras of the Blue and Wallowa Mountains. At this time the UO Herbarium was only seven years old, having been founded by botanist Albert R. Sweetser in 1903, the year the University purchased a collection of 10,000 herbarium sheets from Thomas Jefferson Howell of Portland (Love 1996). Howell, like Cusick, had traveled west in a covered wagon, and had been collecting since the 1870s, botanizing extensively throughout western Oregon (Kruckeberg and Ornduff 2003). It was the western specimens in which Cusick was most interested; he was unfamiliar with this flora and wished to test his theory that the Blues contained floristic elements from the west not found in the Wallowas.

Cusick wrote to Charles Vancouver Piper from Eugene in January noting that he had been working at the University of Oregon "nearly all winter." He later wrote to W.W. Eggleston, a colleague of Piper's in Washington, DC, that while in Eugene he suffered an attack of "nervous prostration." We do not know the details of his illness; however, it is likely that at this time, Sweetser proposed to William that he might wish to sell his large collection to the University. The thought of being without his cherished pressed plants at the Jimmy Creek cabin may have caused Cusick great unease; on the other hand, there can be no doubt that he needed the income. In addition, he may have felt he was being disloyal to Piper who perhaps hoped that Washington State College would eventually be the recipient of the Cusick herbarium. Whatever took place in Eugene that year, Cusick's herbarium of 10,000 sheets was purchased by the University of Oregon in 1911, doubling the size of their collection. The purchase price is not known (Wagner 1994).



Cusickiella douglasii (A. Gray) Rollins (formerly *Draba douglasii* Gray), illustrated by Jeanne R. Janish in Vascular Plants of the Pacific Northwest. The new genus was named for Cusick by Reed Rollins of the Gray Herbarium in 1988. Illustration by Jeanne R. Janish, reprinted with permission from Vascular Plants of the Pacific Northwest, published by the University of Washington Press (1969).

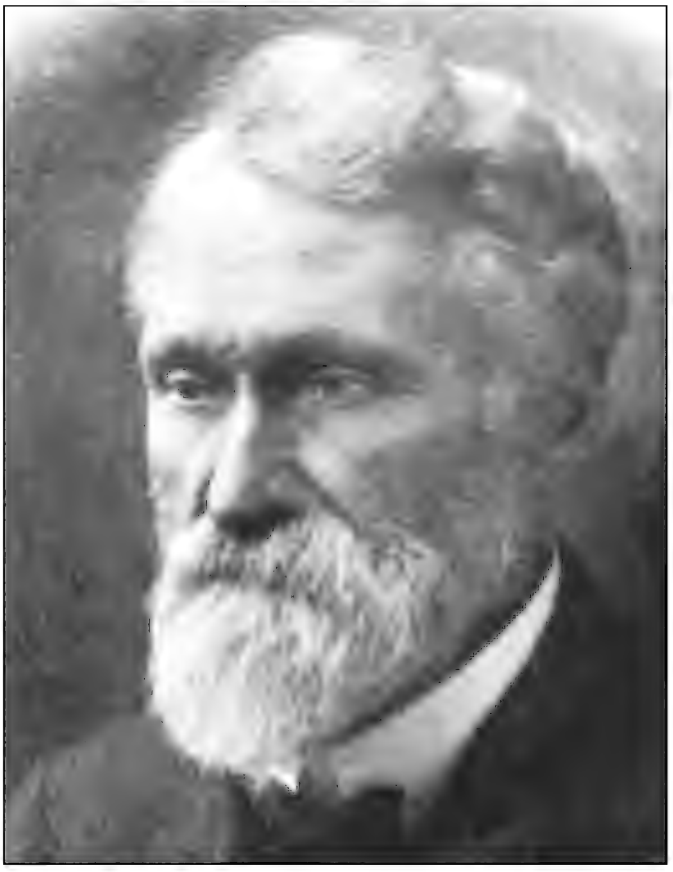
Cusick's Second Herbarium

In 1913 Woodrow Wilson was the President of the United States and war was looming. This year Cusick wrote, "I am 71 years old, nearly blind with cataracts of the eyes and quite deaf." By this time he had moved west again, and was living in a Soldier's Home in Roseburg and collecting heavily in western Oregon. He later stated that his move to Roseburg, against the wishes of his family in Union County, was to enable him to devote time to studying the flora of Douglas County. Cusick's large western Oregon collection would be his final major botanical undertaking, and he spent parts of three years amassing many hundreds of new specimens, which he eventually sold to Washington State College in Pullman. During this period, William began to correspond with the previously mentioned Willard W. Eggleston, an agronomist with the US Bureau of Plant Industry in Washington, DC, and a colleague of C.V. Piper. Eggleston was to become a great admirer of Cusick and eventually the most important compiler of the latter's correspondence and a major chronicler of his life. Cusick wrote to Eggleston from Roseburg that it was his habit to collect three specimens of each taxon, one intended for sale to the University of Oregon in Eugene; it is not known, however, if the University purchased these sheets. Oregon Flora Project records show Cusick collections from Douglas County for 1914-1915, but many of these were apparently acquired by Oregon State College in Corvallis rather than by the University.

Old Age: "Outclassed by a Blind Man"

About this time, after approximately 43 years, the Cusick brothers gave up ranching. William's younger brother Frank Cusick and his family retired from the hard outdoor life on the farm and moved to a house on Catherine Creek on the outskirts of the town of Union. William followed and lived with his brother's family. His long botanizing trips were now over. In February of 1916 he was hospitalized at La Grande where he underwent three difficult and basically unsuccessful cataract operations. A month later he was still in the hospital where his doctor hoped that with a powerful hand lens he might have 50% vision in one eye. Also this year, perhaps not realizing the extent of William's handicap, C.V. Piper, writing from Washington, DC, asked for Cusick's help in compiling a flora of the Blue Mountains. Eggleston was collaborating on this project and both younger men were attempting to map Cusick's various collecting routes to try to pin down the exact locations of his botanical finds. Piper asked for more detailed locality data from William and sent Eggleston to Union with maps on which they hoped the elderly botanist would mark his collecting sites. Eggleston, who was 21 years Cusick's junior, arrived in Union the first week in September. At this time Cusick was 74 years old, almost totally deaf, blind in one eye, and with only marginal vision in the other. However, inspired by the presence of his visitor, he insisted on a field trip to Strawberry Mountain to look for a certain red monkeyflower.

Eggleston wrote, "With his eyes in the condition I have told you, it would seem impossible for him to continue his field work. However, he wanted to go to Strawberry Lake …for a red-flowered *Mimulus* that he had seen there a number of years before, and I



Cusick at age 80. This is the photo that Cusick sent to his friend Charles Vancouver Piper after their last field trip together. Photo courtesy of Washington State University Libraries, Manuscripts, Archives, and Special Collections.

went with him and was surprised at the courage and persistence he showed even with such a handicap. After driving [the horses and wagon] from Prairie City to the north end of Strawberry Lake, we found the lake entirely surrounded by a great 'burn.' It was hard traveling for a man with good eyes and sound legs. Personally I have always prided myself on being a good woodsman, but I found myself outclassed by this blind man. It was getting dusk before we found our plants, and with 4 or 5 miles to get back to the team, but he persisted until the *Mimulus* was discovered and we both got back intact."

On April 2, 1917, the United States entered World War I, but it is unlikely this event made much difference to the 75-year-old botanist, now living with his brother's family in Union and unable to botanize unless accompanied by a companion who could act as his eyes and ears. A year later, the Cusick family received a telegram from Eggleston at the US Bureau of Plant Industries inviting Cusick to join a team that planned to survey the flora of the Blue Mountains. The answer from Cusick's nephew went out by return telegram: "William cannot accept your offer as I am unable to find anyone trustworthy to go with him." A sad moment indeed for the aging botanist. However, despite his overwhelming handicaps, Cusick's memory for plant locations was as keen as ever. In 1919, he wrote, probably with the help of a family member, to Piper with instructions for locating a specific population of a rare grass that had been named for him; the final sentence is particularly poignant, "I will give you the exact locality of the type of *Puccinellia cusickii*. Go to Ed Fickle's house 3/4 of a mile east of Union. Ask him to show you the old footpath (not used now) to Union on the north side of Catherine Creek. 50-100 yards before you come to his line fence you come into the colony of the grass. I think you will find it in considerable abundance. I have for 4 or 5 years done almost nothing at botany. I would need someone to go with me, but that I can't get" (Eggleston papers).

Sale of the Second Herbarium: "In every sheet you will see a blind man."

In the summer of 1921 Charles Vancouver Piper paid his last visit to Cusick, during which the two went together to Hot Lake northwest of Union and made a small collection. Piper later wrote to Cusick identifying species they found: *Ranunculus acris, Helianthus nuttallii, Amelanchier cusickii, Cicuta douglasii* and *Tissa sparsifolia*. The reference to Nuttall's sunflower, *Helianthus nuttallii*, apparently reminded Cusick of an incident from the past, and he replied to Piper: " ...Dr. Gray first called my specimen *Helianthus nuttallii.* I called his attention to the fact that the new species has stout succulent roots with a sweet juice. This and other things caused him to change it to *Helianthus cusickii."* Cusick also remembered clearly that he had collected his namesake sunflower in 1885 in the hills west of Vale, Malheur County. With one of his letters to Piper this year, Cusick enclosed a photograph of himself in old age (Eggleston papers).

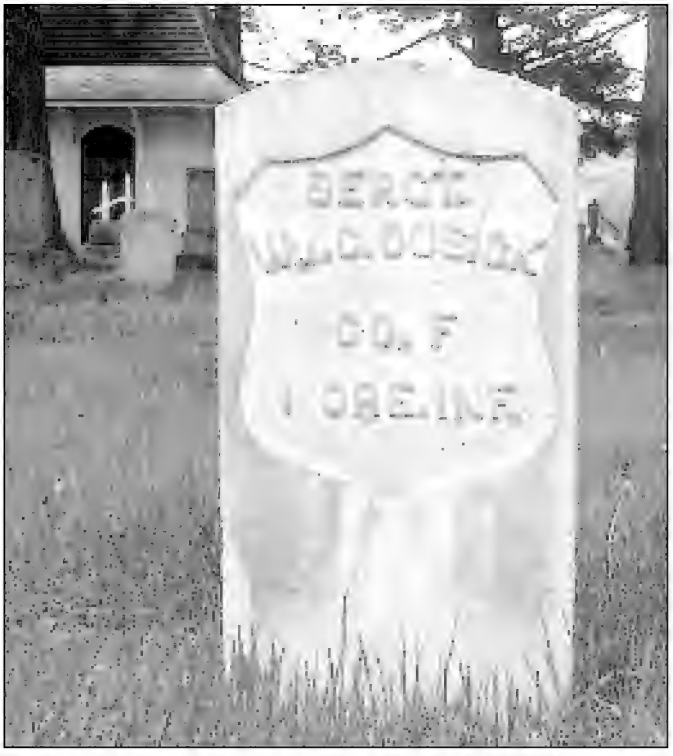
By the fall of that year Cusick had suffered a stroke and could no longer study his collection. At this time he wrote to Washington State College offering to sell the herbarium for $500. In response to his offer, Cusick was visited in Union by young professor Harold St. John of Pullman, who had taken Piper's place as Curator of the college herbarium. St. John found that Cusick's new collection had grown to around 6,000 sheets. Pleased with what he saw in Union, St. John agreed to the asking price and authorized the purchase. Apologizing for his sometimes-indecipherable labels, Cusick had written earlier, "In every sheet you will see a blind man." Later St. John described his visit to Cusick, "His sight and his strength had begun to fail, but his enthusiasm was as keen as ever. Together we talked of a future trip to the alpine slopes of Eagle Cap, or the rugged ravine of the Imnaha, though it was evident at the time that he would never make another long collecting trip" (St. John 1923).

In 1922, when Cusick was 80 years old and in his final year of life, he received what may have been his last letter from Piper asking for a Blue Mountain plant list. The aged botanist replied, "I am very sorry to say I can do nothing for you in regard to the plant lists as I have given no attention to botany for 4 or 5 years, and while I think I have some of the B. M. lists I do not know where they are." The letter was written for him by Frank's wife, Rebecca (Eggleston papers).

Death of an Old Soldier

On Saturday, October 7, 1922 William Conklin Cusick, nearly 81 years old, died at his brother's home in Union. He was survived by Frank, by a sister in Scio and two half-sisters. His stepson, Oscar Cusick, had died of tuberculosis at the age of 23 in 1907.

William's funeral took place the next day at the Union Presbyterian Church, of which Cusick was a long-time member. He was later eulogized by both Harold St. John and Erwin Lange, the latter writing, "No collector of national note was more modest than Cusick. He avoided publicity and only his extant letters and two short articles leave a record of his work. His outstanding work in botany was well known and understood by botanists of America and Europe, yet his neighbors were hardly aware of his greatness. …in 1929 the United States Geographic Board in Washington, DC, named Cusick Mountain in the Wallowa National Forest in his honor."



William Cusick's grave in the Pioneer Cemetery in Union, Oregon. Photo by Julie Gibson.

At least one person in Union was aware of the importance of William Conklin Cusick's botanical work. Reverend B.S. Hughes, Pastor of Cusick's church, wrote to the Department of Agriculture about a year before Cusick's death, requesting an account of the botanist's life. Cusick's friend, W.W. Eggleston responded with an eight-page biographical sketch, emphasizing the significance of William's contributions to botany. Fortunately this summary of Cusick's life as one of Oregon's most important pioneer botanists has been preserved in Eggleston's files and is available in the University of Oregon archives. Whether the information was included in Cusick's funeral ceremony is not known.

William Conklin Cusick was buried as a soldier, rather than a botanist. He is interred in the Union Cemetery, lot number 43, near Emma's grave. His handsome white grave marker reads: "Sergeant W.C. Cusick, Company F, 1st Oregon Infantry." Perhaps a more appropriate epitaph might have been these words written by his friend and fellow seeker of the elusive monkeyflower, W.W. Eggleston: "It will be a long time before a botanist will know the Blue Mountains as well as William Cusick."

Genera named for Cusick: The Tangled History of *Cusickia* and *Cusickiella*

In 1908 Cusick was paid one of botany's supreme compliments when M. E. Jones named a new genus in the Carrot Family *Cusickia*, in his honor. Sadly, the name, like many others proposed by Jones, did not stick, and today the genus is submerged in *Lomatium*. Exactly 80 years later, however, Professor Reed Rollins of the Gray Herbarium at Harvard named the genus *Cusickiella* in the Mustard Family for our tireless collector (Rollins 1988). *Cusickiella douglasii* is a tough, woody, white-flowered crucifer that has usually been known as *Draba douglasii*. Cusick collected the plant in Union County near the Snake River in 1880. Asa Gray named his collection *Braya oregonensis*, but it was soon realized that this was the same species Gray had named *Draba douglasii* in 1867. The German botanist O. E. Schulz at one time called the plant *Cusickia douglasii*; however, since the genus *Cusickia* had once been proposed by Jones, the rules of botanical nomenclature decreed that the name could not be used again. Hitchcock retained the tough little desert mustard in genus *Draba,* where it remained until Rollins happily resurrected the Cusick name in 1988. *Cusickiella* differs from *Draba* in usually having a single seed per silique, and cotyledons which are incumbent with respect to the radicle.

Cusick's monkeyflower (*Mimulus cusickii* (Greene) Rattan) is one of the showiest of the Oregon species named for Cusick. Flowers and leaves are relatively large for a desert annual, with the magenta-red-yellow corolla up to 3.5 cm. in length. The ovate leaves are glandular-pubescent. Note the sandy-rocky habitat. One early Cusick collection now housed at the OSU Herbarium was found at "Deschutes Bridge," on June 19, 1885. Photo by Michael Charters.

Plants named for William Conklin Cusick

The first botanist to name a plant for Cusick was Asa Gray, who named *Veronica cusickii* for the eastern Oregon collector in 1878; happily, this name has endured to the present. Many other well known botanists have also named plants for Cusick over the years. The list includes Sereno Watson, C.V. Piper, E.L. Greene, M.E. Jones, M.L. Fernald, P.A. Rydberg, George Vasey, Alice Eastwood, B.L. Robinson, Coulter and Rose, Philip Munz, C.L. Hitchcock, and Reed Rollins. It is estimated that over 60 taxa have, at one time or another, borne the Cusick name. At present, the Oregon Flora Project recognizes 27 plants named for Cusick in the Oregon Flora Checklist. Arranged here by family, from desert parsley to speedwell:

Apiaceae: *Lomatium cusickii*, Cusick's desert parsley. **Asteraceae:** *Aster cusickii*, Cusick's aster; *Chaenactis cusickii*, Cusick's false yarrow; *Helianthus cusickii*, Cusick's sunflower; *Pyrrocoma carthamoides* var. *cusickii*, narrowhead goldenweed. **Boraginaceae**: *Hackelia cusickii*, Cusick's stickseed. **Brassicaceae**: *Arabis cusickii*, Cusick's rockcress; *Cusickiella douglasii*, cusickiella; *Draba cusickii* var. *cusickii*, Cusick's draba; *Lesquerella occidentalis* var. *cusickii*, Cusick's bladderpod. **Cyperaceae:** *Carex cusickii*, Cusick's sedge. **Fabaceae**: *Astragalus cusickii* var. *cusickii*, Cusick's milkvetch; *Lathyrus nevadensis* ssp. *cusickii*, Cusick's peavine; *Lupinus lepidus* var. *cusickii*, Cusick's lupine; *Trifolium eriocephalum* var. *cusickii*, Cusick's woollyhead clover. **Lamiaceae**: *Agastache cusickii*, Cusick's horsemint. **Liliaceae**: *Camassia cusickii*, Cusick's camas. **Malvaceae**: *Sidalcea cusickii*, Cusick's checkermallow. **Poaceae**: *Poa cusickii* ssp. *cusickii*, Cusick's bluegrass. **Polygonaceae**: *Eriogonum cusickii*, Cusick's buckwheat. **Primulaceae**: *Dodecatheon cusickii*, Cusick's shooting star, *Primula cusickiana* var. *cusickiana*, Cusick's primrose. **Rosaceae**: *Amelanchier cusickii*, Cusick's serviceberry. **Scrophulariaceae**: *Castilleja cusickii*, Cusick's paintbrush; *Mimulus cusickii*, Cusick's monkeyflower; *Penstemon cusickii*, Cusick's penstemon; *Veronica cusickii*, Cusick's speedwell.

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Acknowledgements

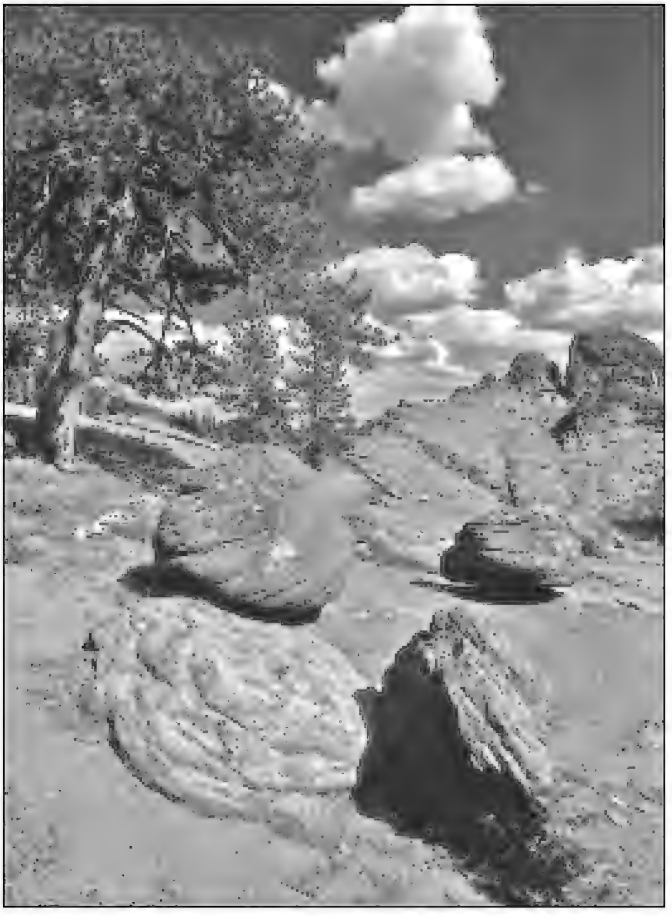
I am extremely grateful to the following who helped with this research in ways far too numerous to outline here: Berna Croco, Lisa DeCesare, Julie Gibson, Charles Johnson, Andrew Kratz, Arthur Kruckeberg, Aaron Liston, Jennifer Love, Glen Love, Greg Nelson, Donna Patterson, Shirley Roberts, Lawrence Stark, and Carolyn Wright. At the University of Oregon Archives and Special Collections: James Fox and Heather Briston. Linda Hardison and the Oregon Flora Project staff. I dedicate this article to my first biology professor, Arthur R. Kruckeberg, who inspired me, believed in me from the start, and continues to support my endeavors.

Rhoda Love has published biographical articles on several Northwest botanists, including Louis Henderson, W.N. Suksdorf, William Hudson Baker, A.R. Sweetser, Lilla Leach, and Lincoln Constance. She has been an NPSO member since the 1970s and was a board member for over a quarter century. She suggested the name *Kalmiopsis* for our journal, explaining that it seemed fitting for the publication to bear the name of a beautiful endemic Oregon shrub, which was discovered by one of our state's foremost women botanists.

Oregon Plants, Oregon Places:

Gearhart Mountain Wilderness

Ron Larson
6527 Climax Ave. Klamath Falls, OR 97603



Palisade Rocks consist of porphyritic lava rock weathered into a variety of fascinating shapes. Photo taken at 6,500 feet elevation by Ron Larson.

Gearhart Mountain, a broad-shouldered giant on the border between Klamath and Lake counties, lures me each July to explore the pristine meadows located on its east flank, seeking further discoveries among the abundant wildflowers. Gearhart Mountain, located about 12 miles northeast of Bly, forms part of the watershed boundary between the Klamath and Chewaucan drainages. It lies within the Fremont-Winema National Forest. Higher areas of the mountain (above 6,300 ft.) received wilderness designation in 1964, with additional lands added in 1984, bringing the current Wilderness total to 22,800 acres. The mountain was named for the Gearhart family, local ranchers who lived in the area in the 1870s (McArthur 1982). During WWII the Mitchell family was picnicking near the southern base of the mountain. They died when a Japanese fire balloon, designed to ignite West Coast forests, exploded when they touched it. A monument now stands near the site of the accident.

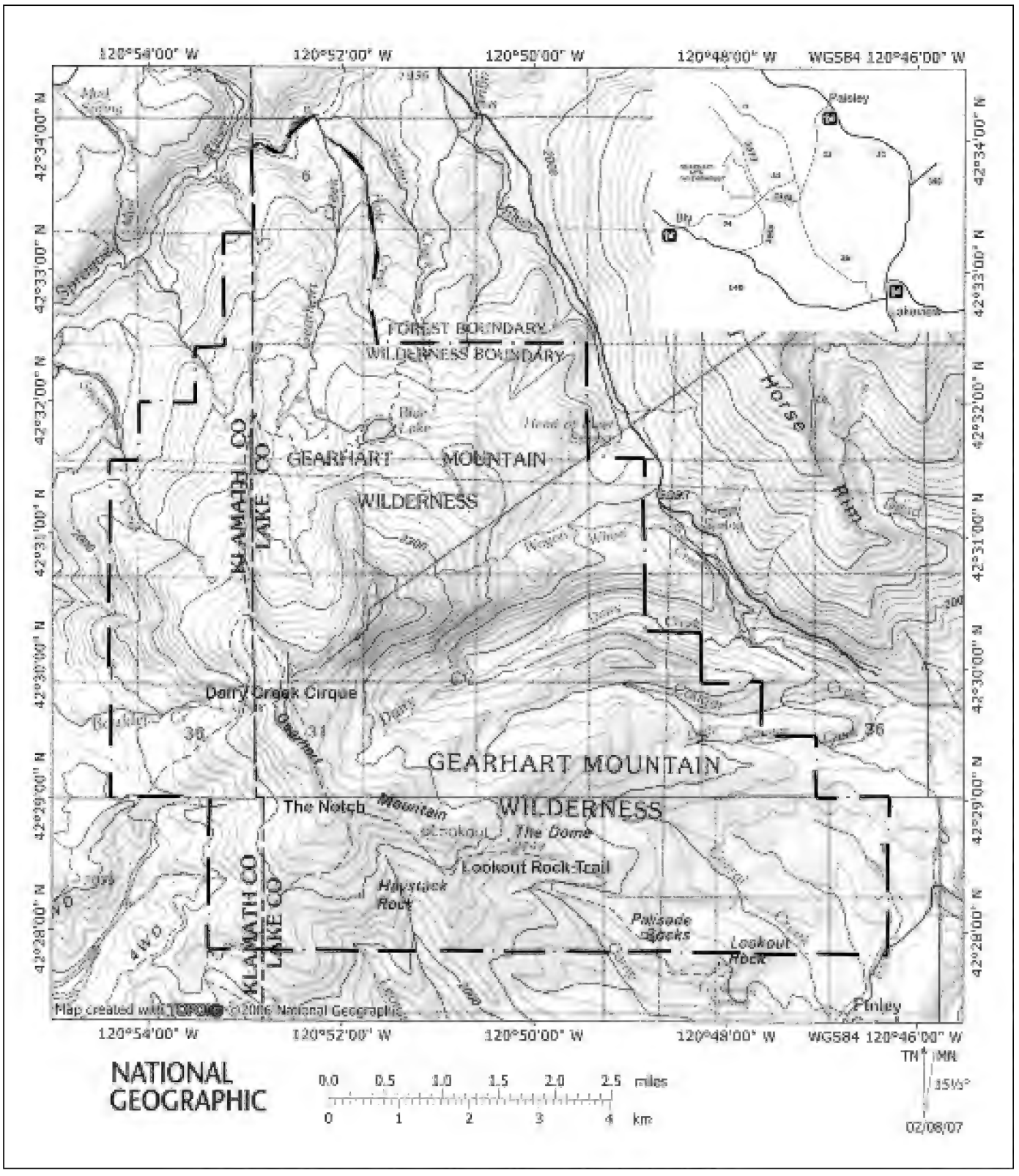
Situated between two physiographic provinces (Cascade Mountains, Basin and Range), Gearhart Mountain provides an opportunity to investigate how its flora has been affected by these two large floristic regions. At 8,364 ft, Gearhart is the highest peak in south-central Oregon between the Cascade and Warner Mountains. The nearest peaks of similar height are Yamsey (8,196 ft.) about 40 miles to the northwest, and Drake (8,407 ft.) about 40 miles to the east. The Cascades lie about 75 miles to the west.

Taylor and Hannan (1999) place Gearhart Mountain in the "High Plateau" climate zone, which has a short growing season, subject to frost throughout the year. In Klamath County, annual precipitation averages 37 inches, with about 80 percent falling between October and March. Average minimum temperatures for January are 15° F. Because of its height and size, precipitation rates on Gearhart are relatively high for the region east of the Cascades. The Forest Service reports a record snow depth of 100 inches, measured at 7,000 ft. elevation on the mountain. Although this is likely exceptional, it emphasizes the importance of snow in the water budget of the mountain. Snow covers most of higher terrain from November to June, and in heavy snowfall years, some small drifts last through summer and fall. As a consequence, springs, seeps, wet meadows, and other wetlands are plentiful at the higher elevations. The basin formed by Dairy Creek Cirque on the east side of the mountain has the highest concentration of meadows. These start at about 7,600 ft. and continue down slope for about a mile.

Geology and Soils

Gearhart is a Miocene shield volcano composed of numerous low-viscosity lava flows that extend outwards about ten miles from the mountain. (Newberry Crater, south of Bend is also a shield volcano, and other shield volcanoes occur in the area just east of the Cascades from northern California to Washington.) On Gearhart Mountain, this gray, igneous, porphyritic rock forms prominent outcrops and formations, some over 300 feet high. Their characteristic platy, slate-like fracture creates conspicuous rock formations, many of which are named; for example, Haystack Rock, The Dome, Lookout Rock, and Palisade Rocks.

Powerful erosional forces, especially glaciers, have carved prominent valleys that dominate the terrane on the north and east sides. Well preserved moraine loops occur at distances of two to three miles from cirque headwalls on the northeast side of the mountain (Osborn and Beavis 2001). The Dairy Creek Cirque is two miles wide. Dairy Creek flows into the Chewaucan River, which drains into Lake Abert. Lake Abert basin lacks external drainage and some geographers consider it part of the Great Basin. Near-vertical cliffs of the massive headwall of the Dairy Creek Cirque rise over 300 feet high. The headwall has eroded through on the west, forming a prominent cliff that can be seen from a



Map of Gearhart Mountain Wilderness showing Lookout Rock Trail, Palisade Rocks, and Dairy Creek Cirque in the southern part. Gearhart Mountain is located off Highway 140 about 50 miles ENE of Klamath Falls and 35 miles NW of Lakeview. Topographic map created using TOPO!® ©1998 Wildflower Productions, www.topo.com. Vicinity inset map from USFS website.

great distance. Prominent talus slopes and slide debris occur below the cliffs. Other cirques and valleys occur around the mountain.

At the higher elevations, soils are poorly developed and contain a high fraction of volcanic ash and rock; lower sites have sandy loam soils (Hopkins 1979). Habitats on the mountain vary by elevation, aspect, soils, moisture, presence of exposed rock, and other factors. Glacial activity on the north and east sides of the mountain has contributed to habitat diversity, especially by gouging basins that trap fine sediments and water, thus creating wetlands. The south and west aspects are warmer and drier than the east and north slopes, and these differences are reflected in the plant cover. Coniferous forests cover most of the mountain, except were soils are saturated or the substrate is primarily rock.

Plant Collections and Trail Access

According to records at Oregon State University Herbarium, about 250 sheets have been collected from Gearhart Mountain, representing 166 plant species. Major collections were made by John Leiberg in 1896, Lincoln Constance in 1928, May Loveless in 1931, and Virginia Crosby, Lakeview BLM botanist, in 1976 and 1979. I have been making observations since 1998.

Most plant collections, including my own observations, have been from near Trail 100, which starts at the wilderness boundary on the south side of the mountain near the Corral Creek campground and Finley Corrals. From the trailhead at 6,300 ft., this trail ascends for 5 miles to 8,000 feet, before descending to 7,500 ft. in the Dairy Creek Cirque basin. From there it continues north for a total distance of 11 miles. To access the west side of the mountain, use Boulder Creek Trail 100A, which originates at 6,500 ft. A third trail, Lookout Rock, is accessed via a short spur road (#012) off Forest Road 34, which is about a half mile north of Bly on Highway 140.

Overview of Plant Communities

Lookout Rock Trail

Forests of western juniper (*Juniperus occidentalis*) and ponderosa pine (*Pinus ponderosa*) occupy the south and west slopes between 6,300 and 7,000 ft. elevation. A broad area of scabland with only scattered trees covers the southwest slope near the Sprague River. In contrast, lodgepole pine (*Pinus contorta*) and white fir (*Abies concolor*) dominate the north and east aspects. White fir extends onto the south and west sides, where it is joined by scattered ponderosa and sugar pine (*Pinus lambertiana*) up to about 7,000 feet, in what could be called the montane zone. Above this, in a subalpine zone, lodgepole pine and whitebark pine (*Pinus albicaulis*) dominate, with the latter becoming more prevalent above 7,500 ft.

Lookout Rock Trail enters the wilderness in a parkland of widely scattered mature white fir and ponderosa pine. The yellowish wolf lichen (*Letharia vulpina*) grows as an epiphyte on the bark of the firs, except near the base of the trees for about three to four feet, apparently marking the normal depth of winter snow. The forest understory consists of creeping snowberry (*Symphoricarpos mollis*), western hawkweed (*Hieracium scouleri*), bottlebrush squirreltail (*Elymus elymoides*), bitter dogbane (*Apocynum androsaemifolium*), Nuttall's linanthus (*Leptosiphon nuttallii*), pinemat manzanita (*Arctostaphylos nevadensis*), pinedrops (*Pterospora andromedea*), kelloggia (*Kelloggia galioides*), silverleaf phacelia (*Phacelia hastata*), waterleaf phacelia (*P. hydrophylloides*), bracken (*Pteridium aquilinum*), creeping Oregon grape (*Berberis repens*), wax currant (*Ribes cereum*) and sticky currant (*R. viscosissimum*). Colorful scarlet gilia (*Ipomopsis aggregata*) occurs in open, sunny sites where rufous hummingbirds are attracted to its nectar.

At about 6,500 ft. elevation, prominent sculpted rock outcrops have been named Palisade Rocks. Here, among the stunted ponderosa pines that grow from cracks in the rocks or from pockets of soil, I found a single whitebark pine. The pines are joined by an assortment of drought tolerant shrubs, including mountain spray (*Holodiscus dumosus*), curl-leaf mountain mahogany (*Cercocarpus ledifolius*), rubber rabbitbrush (*Ericameria nauseosa*), and bitter cherry (*Prunus emarginata*). Also finding refuge in the rock crevices are roundleaf alumroot (*Heuchera cylindrica*), hotrock penstemon (*Penstemon deustus*), and western boneset (*Ageratina occidentalis*). In the seasonally dry gravel and sandy soils at Palisade Rocks I have found mountain and prickly sandworts (*Arenaria capillaris* and *A. aculeata*), western hawkweed, wormleaf stonecrop (*Sedum stenopetalum*) and several buckwheats: sulphur flower (*Eriogonum umbellatum*), barestem (*E. nudum*), and broom (*E. vimineum*). Grasses include western needlegrass (*Achnatherum occidentale*), California brome (*Bromus carinatus*),

Whitebark pine, flagged by the prevailing southwest wind, grow on the west side of Gearhart Mountain in the subalpine zone, about 8,000 feet elevation. Mountain spray and mountain gooseberry grow protected by boulders. Discoid goldenweed, a rare Intermountain sub-shrub, also grows on these slopes. Photo by Ron Larson.

annual hairgrass (*Deschampsia danthonioides*), and bottlebrush squirreltail.

Beginning at about 7,000 feet, ground cover in the white fir forest becomes more diverse and abundant. Dominant herbs in this zone include western hawkweed, white flowered hawkweed (*Hieracium albiflorum*), kelloggia, sticky chickweed (*Pseudostellaria jamesiana*), and several wintergreen species, including bog (*Pyrola asarifolia*), white vein (*P. picta*), and sidebells (*Orthilia* [*Pyrola*] *secunda*). Also found in this area are Nuttall's linanthus, Oregon sunshine (*Eriophyllum lanatum*), western valerian (*Valeriana occidentalis*), and coyote mint (*Monardella odoratissima*).

At about 7,500 feet, stands of quaking aspen (*Populus tremuloides*) appear at small seeps and springs, along with a variety of wetland herbs, including red columbine (*Aquilegia formosa*), Columbia monkshood (*Aconitum columbianum*), western red baneberry (*Actaea rubra*), Gray's lovage (*Ligusticum grayii*), sweet cicely (*Osmorhiza berteroi*), ranger's buttons (*Sphenosciadium capitellatum*), Bolander's tarweed (*Kyhosia bolanderi*), California false hellebore (*Veratrum californicum*). On seasonally moist slopes below rocky cliffs, such as at The Dome, patches of blue stickseed (*Hackelia micrantha*) and the strongly aromatic nettle-leaved horsemint (*Agastache urticifolia*) occur. The pink-purple heads of the horsemint attract a variety of butterflies and bees. Steep and exposed rocky ridges on the south slopes are dominated by low sagebrush (*Artemisia arbuscula*), mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), coyote mint, curl-leaf mountain mahogany, common snowberry (*Symphoricarpos albus* var. *laevigatus*), woolly mule's ears (*Wyethia mollis*), spreading phlox (*Phlox diffusa*), and others. Sulphur flower buckwheat, coyote mint, and Bloomer's goldenweed (*Ericameria bloomeri*) are abundant. Butterflies find flowers of latter two species especially attractive. At about 7,300 feet where the soil becomes heavily influenced by volcanic ash, whitebark pine begins to replace the white fir. Above 7,700 feet white fir becomes scarce and the trees are much smaller than at lower elevations. Blue grouse are common in this zone and during July one can hear the males hooting.

Around 8,000 feet, ground cover becomes sparse, perhaps owing to changes in soils, which appear to consist mainly of Mount Mazama ash. Dominant herbs include small sedges, sandworts, Davidson's penstemon (*Penstemon davidsonii* var. *davidsonii*), sulphur flower buckwheat, spreading phlox, waterleaf phacelia, coyote mint, Oregon catchfly (*Silene oregana*), western valerian, pinemat manzanita, Bloomer's goldenweed, low sage, and bottlebrush squirreltail. Blue leaved penstemon (*Penstemon glaucinus*), an endemic on Oregon Natural Heritage Program (ONHP) list 1, grows with prickly sandwort under an open canopy of whitebark pine in dry ashy soils. Green-tinged paintbrush (*Castilleja chlorotica)*, another endemic on the ONHP list 1, grows on rocky ridges and in crevices along with mountain spray, mountain gooseberry (*Ribes montigenum*), roundleaf alum root, cutleaf daisy (*Erigeron compositus*), rock sword fern (*Polystichum scopulinum*) and lace lipfern (*Cheilanthes gracillima*). Common juniper (*Juniperus communis* var. *montana*) forms spreading mounds. I found two ponderosa pine trees on the south slope at 8,000 feet: their twisted and broken limbs provide a testament to the strong winds that buffet the mountain. At this elevation, powerful desiccating winds blast the whitebark pine with ice crystals, creating a flagged growth form with supple limbs oriented away from the prevailing southwest winds.

South-facing slopes (about 7,500 ft.) with gravelly soils are dominated by low sagebrush, mountain big sagebrush, coyote mint, and sulphur flower buckwheat. "The Notch" visible in the distance was formed when two glaciers cut through the rock, creating a landform termed a "col." Photo by Ron Larson.

The panoramic views from the crest of the Lookout Rock Trail and from the top of the mountain are stunning. One can see down to the meadows of the Dairy Creek Cirque, Winter Rim to the northeast, Dead Horse Rim and the Warner Mountains to the east, Cougar and Grizzly peaks to the southeast, the Sprague River Valley to the south, and Mt. McLoughlin far in the distance to the southwest. As the trail passes over the narrow ridge at "The Notch," the aspect changes from south-facing to northeast-facing. Snow persists into July in this sheltered, shady area and few vascular plants grow here except small whitebark pines, and two subalpine herbs, Davidson's penstemon and alpine springbeauty (*Claytonia megarhiza*), which emerge from rock crevices.

Boulder Creek Trail

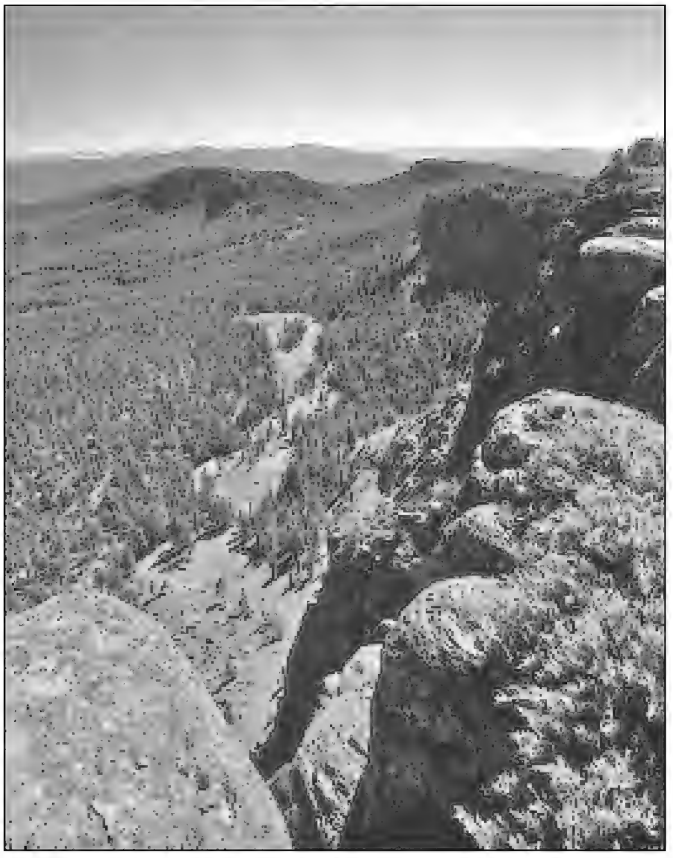
Access to the west side of the mountain is from the Boulder Creek

On the south slope at about 7,800 ft., ice-sculpted cliffs end in a community of snowbrush, mountain gooseberry, roundleaf alumroot, cutleaf daisy, rock sword fern, and lace lipfern. Mounds of common juniper grow above the cliff; whitebark pine below. Photo by Ron Larson.

Trail (#100A). The trailhead begins at 6,500 ft elevation off Forest Road #018, and passes through lodgepole pine and white fir stands. After 1.3 miles it reaches a large meadow rich in wildflowers and rimmed by aspens near the head of Boulder Creek at 7,500 ft. elevation. From here, it is a short one-third mile scramble up a steep talus slope to the highest point on the mountain. The flora along this trail shares many of the same species present along the Lookout Rock Trail. One notable exception is the presence of discoid goldenweed (*Ericameria discoidea*) at about 8,000 ft. on a dry, rocky slope. This low shrub is on ONHP list 4 and appears to be at its western-most location here. Because the Boulder Creek Trail gets less use, it can be hard to follow and therefore is not recommended for novice hikers.

Dairy Creek Cirque

Numerous springs, seeps, pools and stream channels add diversity to a long meadow at about 7,600 feet just below the headwall and its talus slope in Dairy Creek Cirque. This area appears to have been a small tarn or glacier-formed lake, based on the presence of a low berm (probably a moraine) that likely formed a dam. Over time, the tarn filled with sediments and peat until only a series of pools and small streams remain. Other wet meadows are scattered across the upper part of the cirque basin and down slope for about a half mile. It is unlikely that these meadows have been grazed by cattle, and are among the highest elevation pristine meadows in this part of the state. These subalpine wetlands support an especially rich flora, although they represent a tiny fraction of the wilderness area. They contain about one-third of the vascular plant species found in the Wilderness. In July, the meadows are especially colorful with a high diversity of wildflowers including alpine and arrowleaf groundsels (*Packera subnuda* [*Senecio cymbalarioides*] and *S. triangularis*), longleaf, hairy and Parry's arnicas (*Arnica longifolia*, *A. mollis*, and *A. parryi*). Orchids are represented by white bog orchid (*Platanthera dilatata* var. *leucostachys*), sparse flowered bog orchid (*P. sparsiflora*), slender bog orchid (*P. stricta*), and hooded ladies tresses (*Spiranthes romanzoffiana*). Other wetland plants include subalpine daisy (*Erigeron glacialis*) [Note: new name for *E. peregrinus* var. *callianthemus*], black twinberry (*Lonicera involucrata*), alpine laurel (*Kalmia microphylla*), pink mountain heather (*Phyllodoce empetriformis*), meadow lupine (*Lupinus polyphyllus*), American bistort (*Bistorta bistortoides*), creeping sibbaldia (*Sibbaldia procumbens*), marsh marigold (*Caltha leptosepala*), alpine shooting star (*Dodecatheon alpinum*), primrose monkeyflower (*Mimulus primuloides*), elephant's head (*Pedicularis groenlandica*), scarlet paintbrush (*Castilleja miniata*), and small white violet (*Viola macloskeyi*). Shrubs include bog birch (*Betula glandulosa*), and several unidentified willows (*Salix* spp.) and huckleberries (*Vaccinium* spp.). I have not yet identified the many



From the top of the mountain at 8,300 ft., one can view the bowl-shaped cirque of Dairy Creek. Wet meadows appear as islands surrounded by whitebark pine forests. Photo by Ron Larson.

species of sedges and rushes in the wetlands, but several species present in the Oregon State University Herbarium are in the appended plant list.

The headwall of the Dairy Creek Cirque and associated talus slopes support some species that are not found elsewhere in the Wilderness, including American alpine lady fern (*Athyrium alpestre*), Cascade parsley fern (*Cryptogramma cascadensis*), Brewer's cliff brake (*Pellaea breweri*), mountain sorrel (*Oxyria digyna*), and the colorful rose willowherb (*Epilobium obcordatum*). High overhead, I saw common juniper growing from ledges.

Floristics

Gearhart Mountain sits in the southern part of the East Slope Cascades Ecoregion, which runs the length of the state (from north to south) and is widest in the southern part of Klamath County (Kagan *et al.* 2004). Anderson *et al.* (1998) place it in the Mazama Ecological Province, which covers Deschutes County and the northern half of Klamath County, and a small portion of Lake County near Gearhart Mountain. Anderson *et al.* (1998) indicate that this province is typified by soils containing Mount Mazama ash.

I compared the flora of Gearhart Mountain Wilderness with that of Crater Lake National Park (Zika 2003) and Steens Mountain (Mansfield 1999). I selected these floras because they are well known, lie at approximately the same latitude in Oregon (between 42° and 43° North Latitude), and represent the southern Cascade Mountains and Intermountain floras, to which the Gearhart Mountain flora is most likely allied.

Although the Gearhart Mountain Wilderness flora is incompletely studied, 250 species in 50 families have been identified. Once the monocots are better known, and plants from lower elevations are included, this number will increase. Only two introduced plant species, common dandelion (*Taraxacum officinale*) and yellow salsify (*Tragopogon dubius*), were observed and these were uncommon.

Crater Lake and Steens Mountain share 119 of the 250 plant species (48%) that were found on Gearhart Mountain. Thus, many wide-ranging species are present in all three areas. However, about half (52%) of the species recorded on Gearhart Mountain, were absent from either Crater Lake or Steens Mountain, indicating their floras are substantially different, which could be expected based on their locations and the lack of dispersal corridors for high elevation plants.

The Gearhart Mountain flora shows an approximate equal relationship with both Crater Lake National Park (167 species or 67% in common) and Steens Mountain (184 species or 74%). This is despite the closer proximity of Gearhart Mountain to Crater Lake (70 miles) than to Steens Mountain (120 miles). When the floras are compared more closely the relationships and differences becomes more apparent. Gearhart Mountain Wilderness shares seven of eight coniferous species with Crater Lake National Park, but only three with Steens Mountain. Similarly, of the ten ericaceous plants (mostly small shrubs) in Gearhart Mountain Wilderness all are also present in Crater Lake National Park, but only three are found on Steens Mountain. Other groups indicate a greater affinity with Steens Mountain. An example is Asteraceae, which is represented by 36 species on Gearhart Mountain. Of these, 31 species (86%) also occur on Steens Mountain, while only 23 (64%) are shared with Crater Lake. Some examples of species common to Gearhart and Steens mountains that are absent from Crater Lake are western juniper, western boneset, bog birch, creeping Oregon grape, sticky geranium, mountain gooseberry, nettle leaved horsemint, rose willowherb, alpine springbeauty, curl-leaf mountain mahogany, roundleaf alumroot, yellow bell (*Fritillaria pudica*), and western peony (*Paeonia brownii*). Another example is discoid goldenweed, which has a distribution limited to sites east of Gearhart Mountain in Oregon (e.g., Steens Mountain and Crane Mountain).

In Dairy Creek cirque, high cliffs and steep talus slopes merge downslope into wet meadows, ponds, and small creeks.

Ten species present on Gearhart Mountain are unknown from either Crater Lake National Park or Steens Mountain, including woolly mule's ears, waterleaf phacelia, blue-leaved penstemon, mountain kittentails, and green-tinged paintbrush. Waterleaf phacelia is a southern Cascadian species, but is not known to occur in Crater Lake National Park. Blue leaved penstemon is endemic to high elevations of Klamath and Lake counties, but is absent in the Cascades. The range of woolly mule's ears includes the Cascade Mountains in California, Klamath Mountains in

Oregon and California, the Warner Mountains in Oregon and California, and other areas in Klamath and Lake counties, Oregon, but does not include Crater Lake National Park. Mountain kittentails range from the Warner Mountains to eastern Washington and Idaho. Green-tinged paintbrush is endemic to Crook, Deschutes, Lake, and Klamath counties (see sidebar).

My analysis indicates that Gearhart Mountain's flora blends elements from each of the neighboring floristic provinces. Based on the 250 species that have been recorded, the flora of Gearhart Mountain Wilderness shows greater affinity with floras to the east than with other regions. Cronquist *et al.* (1972) drew the western boundary of the Lake floristic section of the Intermountain West only 15 miles east of Gearhart Mountain, so it is geographically very close to that region.

Castilleja chlorotica Piper

Green-tinged paintbrush is endemic to central Oregon: the Eastern Cascades and Foothills ecoregion, from Cook and Deschutes counties south to Klamath and Lake counties (USDA Forest Service 2007). It is found in a diversity of habitats, but mostly in forest openings on seasonally dry, south and west slopes, and summits from 4,300 to over 8,000 feet elevation, where soils are shallow, rocky, and often have a high content of volcanic ash. The plants are typically about a foot tall, the foliage is sticky, and the leaves have a wavy margin. Although the overall color is a bright green (hence its scientific and common names), the stem and bracts can be tinted reddish or purple. It is the only green paintbrush in central Oregon. A hemi-parasite of big sagebrush and bitterbrush, and possibly other shrubs, green-tinged paintbrush obtains water and minerals from its deep-rooted hosts.

Its heritage ranking is G3, owing to its rarity. All known populations (~180) are on Federal lands with the majority on Fremont National Forest in Lake County (USDA Forest Service 2007). Some populations are quite large and the Forest Service estimates that the total number of plants is ~0.5 million. It has three major areas of distribution: Gearhart Mountain and Winter Rim on Fremont National Forest, and Wake, Pistol, and Wagon buttes in Deschutes National Forest (USDA Forest Service 2007).

This species was first collected in 1896 near the summit of Gearhart Mountain by John Leiberg, a botanist who was collecting for the National Herbarium of the Smithsonian Institution (Walker 2000). At the time, Leiberg was collecting in eastern Oregon with Fredrick Coville, who was Chief Botanist at National Herbarium. Later that summer Leiberg and Coville collected at Crater Lake National Park (Horn 2005). The holotype specimen (labeled "Gayhart Buttes") is at the Smithsonian Institution. It was described in 1920 by C.V. Piper.

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Vascular Plant List

Nomenclature follows the 2007 Oregon Flora Project checklist. Names of taxa native to Oregon are printed in italic *Garamond*; alien taxa are in italic *Gill Sans*, a sans-serif type. Species that have special Federal or State status are noted by an asterisk before the scientific name.

FERNS AND THEIR ALLIES

DENNSTAEDTIACEAE (Bracken Family)
Pteridium aquilinum (L.) Kuhn (bracken)
DRYOPTERIDACEAE (Wood Fern Family)
Athyrium alpestre (Hoppe) Clairv. (American alpine lady fern)
Athyrium filix-femina (L.) Mert. (lady fern)
Cystopteris fragilis (L.) Bernh. (brittle fern)
Polystichum scopulinum (D.C. Eaton) Maxon (rock sword fern)
ISOETACEAE (Quillwort Family)
Isoetes bolanderi Engelm. (Bolander's quillwort)
PTERIDACEAE (Brake Family)
Cheilanthes gracillima D.C. Eaton (lace lipfern)
Cryptogramma cascadensis E.R. Alverson (Cascade parsley fern)
Pellaea breweri D.C. Eaton (Brewer's cliff brake)

Lace lipfern (*Cheilanthes gracillima*) fills rock crevices at Palisade Rocks and cliffs above 7,500 feet elevation on the south side of the mountain. Photo by Ron Larson.

GYMNOSPERMS

CUPRESSACEAE (Cypress Family)
Juniperus communis L. var. *montana* Ait. (common juniper)
Juniperus occidentalis Hook. (western juniper)
PINACEAE (Pine Family)
Abies concolor (Gord. & Glend.) Lindl. ex Hildebr. (Sierra white fir)
Pinus albicaulis Engelm. (whitebark pine)
Pinus contorta Douglas ex Loud. var. *latifolia* Engelm. (lodgepole pine)
Pinus lambertiana Douglas (sugar pine)
Pinus monticola Douglas ex D. Don (western white pine)
Pinus ponderosa Douglas ex C. Lawson (ponderosa pine)

DICOTYLEDONS

APIACEAE (Carrot Family)
Ligusticum grayi J.M. Coult. & Rose (Gray's lovage)
Lomatium triternatum (Pursh) J.M. Coult. & Rose (nineleaf biscuitroot)
Osmorhiza berteroi DC. (sweet cicely)
Sanicula graveolens Poepp. (Sierra sanicle)
Sphenosciadium capitellatum A. Gray (ranger's buttons)
APOCYNACEAE (Dogbane Family)
Apocynum androsaemifolium L. (bitter dogbane)
ASTERACEAE (Sunflower Family)
Achillea millefolium L. (yarrow)
Ageratina occidentalis (Hook.) R.M. King & H. Rob. (western boneseat)
Agoseris aurantiaca (Hook.) Greene (orange agoseris)
Antennaria rosea Greene (rosy pussytoe)
Arnica cordifolia Hook. (heart leaf arnica)
Arnica longifolia D.C. Eaton (longleaf arnica)
Arnica mollis Hook. (hairy arnica)
Arnica parryi A.Gray (Parry's arnica)
Artemisia arbuscula Nutt. ssp. *arbuscula* (low sagebrush)
Artemisia tridentata Nutt. ssp. *vaseyana* (Rydb.) Beetle (mountain big sagebrush)
Balsamorhiza sagittata (Pursh) Nutt. (arrowleaf balsamroot)
Cirsium scariosum Nutt. (elk thistle)
Crepis occidentalis Nutt. (western hawksbeard)
Ericameria bloomeri (A. Gray) J.F. Macbr. (Bloomer's goldenweed)
**Ericameria discoidea* (Nutt.) G.L. Nesom (discoid goldenweed)
Ericameria nauseosa (Pall. ex Pursh) G.L. Nesom & G.I. Baird (rubber rabbitbrush)
Erigeron compositus Pursh (cutleaf daisy)
Erigeron glacialis (Nutt.) A Nelson (subalpine daisy)
Erigeron inornatus (A. Gray) (California rayless daisy)
Eriophyllum lanatum (Pursh) J. Forbes var. *achillaeoides* (DC.) Jeps. (Oregon sunshine)
Hieracium albiflorum Hook. (white flowered hawkweed)
Hieracium scouleri Hook. (western hawkweed)
Kyhosia (*Madia*) *bolanderi* (A. Gray) B.G. Baldwin (Bolander's tarweed)
Madia exigua (Sm.) A. Gray (little tarweed)
Microseris nutans (Hook.) Sch. Bip. (nodding microseris)
Packera subnuda (DC.) Trock & T.M. Barkley [*Senecio cymbalaroides*] (alpine groundsel)
Senecio fremontii var. *exaltatus* Torr. & A. Gray. (dwarf mountain groundsel)
Senecio integerrimus Nutt. (common groundsel)
Senecio triangularis Hook. (arrowleaf groundsel)
Solidago canadensis L. (Canada goldenrod)
Stephanomeria lactucina A. Gray (large flowered wirelettuce)
Symphyotrichum (*Aster*) *ascendens* (Lindl.) G.L. Nesom (long leafed aster)
Symphyotrichum (*Aster*) *foliaceum* (Lindl.) G.L. Nesom (leafy bracted aster)
Taraxacum officinale Weber ex F.H. Wigg. (common dandelion)
Tragopogon dubius Scop. (yellow salsify)
Wyethia mollis A. Gray (woolly mule's ears)
BERBERIDACEAE (Barberry Family)
Berberis repens Lindl. (creeping Oregon grape)
BETULACEAE (Birch Family)
Alnus incana (L.) Moench ssp. *tenuifolia* (Nutt.) Breitung (mountain alder)
Betula glandulosa Michx. (bog birch)
BORAGINACEAE (Borage Family)
Cryptantha ambigua (A. Gray) Greene (obscure cryptantha)
Hackelia micrantha (Eastw.) J.L.Gentry (blue stickseed)

Mertensia ciliata (Torr.) G. Don. (broad leaved bluebells)
Mertensia longifolia (Nutt.) G. Don. (leafy bluebell)
Myosotis laxa Lehm. (small forget-me-not)
Plagiobothrys bracteatus (Howell) I.M. Johnst. (bracted plagiobothrys)

BRASSICACEAE (Mustard Family)
Arabis drummondii A. Gray (Drummond's rockcress)
Arabis holboellii Hornem. (Holboell's rockcress)
Arabis lyallii S. Watson var. *nubigena* (J.F. Macbr. & Payson) Rollins (Lyall's rockcress)
Arabis platysperma A. Gray (flatseed rockcress)
Arabis sparsiflora Nutt. var. *sparsiflora* (sicklepod rockcress)
Barbarea orthoceras Ledeb. (American wintercress)
Cardamine cordifolia var. *lyallii* (S. Watson) A. Nelson & J.F. Macbr. (large mountain bittercress)
Descurainia incisa (Engelm. ex A. Gray) Britton (mountain tansy mustard)
Rorippa curvisiliqua (Hook.) Bessey ex Britton (curvepod yellowcress)

CAPRIFOLIACEAE (Honeysuckle Family)
Lonicera involucrata (Rich.) Banks ex Spreng. var. *involucrata* (black twinberry)
Sambucus mexicana C. Presl ex DC. (blue elderberry)
Symphoricarpos albus (L.) S.F. Blake var. *laevigatus* Fernald (common snowberry)
Symphoricarpos mollis Nutt. (creeping snowberry)

CARYOPHYLLACEAE (Pink Family)
Arenaria aculeata S. Watson (prickly sandwort)
Arenaria capillaris Poir. (mountain sandwort)
Pseudostellaria jamesiana (Torr.) W.A. Weber & R.L. Hartman (sticky chickweed)
Silene douglasii Hook. (Douglas' catchfly)
Silene oregana S. Watson (Oregon catchfly)

CONVOLVULACEAE (Morning-glory Family)
Calystegia occidentalis ssp. *occidentalis* (A. Gray) Brummitt (western morning glory)

CRASSULACEAE (Stonecrop Family)
Sedum stenopetalum Pursh. spp. *stenopetalum* (wormleaf stonecrop)

ERICACEAE (Heath Family)
Arctostaphylos nevadensis A. Gray (pinemat manzanita)
Arctostaphylos patula Greene (greenleaf manzanita)
Chimaphila umbellata (L.) W. Bartram var. *occidentalis* (Rydb.) S.F. Blake (prince's pine)
Kalmia microphylla (Hook.) A. Heller (alpine laurel)
Orthilia secunda (L.) House (side bells wintergreen)
Phyllodoce empetriformis (Smith) D. Don (pink mountain heather)
Pterospora andromedea Nutt. (pinedrops)
Pyrola asarifolia Michx. (bog wintergreen)
Pyrola picta Smith (white vein wintergreen)
Vaccinium cespitosum Michx. (dwarf huckleberry)

FABACEAE (Pea Family)
Astragalus filipes Torr. ex A. Gray (threadstalk milkvetch)
Lupinus argenteus Pursh (silver lupine)
Lupinus latifolius J. Agardh (broad leaved lupine)
Lupinus lepidus Douglas ex Lindl. (dwarf lupine)
Lupinus leucophyllus Douglas ex Lindl. (Eggleston's lupine)
Lupinus polyphyllus Lindl. (meadow lupine)
Trifolium longipes Nutt. (longstalk clover)
Vicia americana Muhl. ex Willd. var. *americana* (American vetch)

GENTIANACEAE (Gentian Family)
Gentianopsis simplex (A. Gray) H.H. Iltis (one flowered gentian)

GERANIACEAE (Geranium Family)
Geranium viscosissimum Fisch. & C.A. Mey. ex C.A. Mey. (sticky geranium)

GROSSULARIACEAE (Gooseberry Family)
Ribes cereum Douglas (wax currant)
Ribes erythrocarpum Cov. & Leib. (Crater Lake currant)
Ribes montigenum McClatchie (mountain gooseberry)
Ribes viscosissimum Pursh (sticky currant)

HYDROPHYLLACEAE (Waterleaf Family)
Hydrophyllum capitatum Douglas (ballhead waterleaf)
Nemophilia pedunculata Douglas ex Benth (meadow nemophilia)
Phacelia hastata Douglas ex Lehm. (silverleaf phacelia)
Phacelia hydrophylloides A. Gray (waterleaf phacelia)

HYPERICACEAE (St. John'swort Family)
Hypericum anagalloides Cham. & Schltdl. (bog St. John's wort)

LAMIACEAE (Mint Family)
Agastache urticifolia (Benth.) Kuntze (nettle leaved horsemint)
Monardella odoratissima Benth. (coyote mint)

MALVACEAE (Mallow Family)
Sidalcea oregana (Nutt.) A. Gray (Oregon checker mallow)

ONAGRACEAE (Evening Primrose Family)
Chamerion (*Epilobium*) *angustifolium* (L.) Holub (fireweed)
Epilobium obcordatum A. Gray (rose willowherb)
Gayophytum diffusum Torr. & A. Gray ssp. *diffusum* (spreading groundsmoke)

PAEONIACEAE (Peony Family)
Paeonia brownii Douglas ex Hook. (western peony)

Nuttall's linanthus, a white-flowered forb that is widely distributed east of the Cascades and Sierras, grows on the south side of the mountain in both forested and open sites. Photo by Ron Larson.

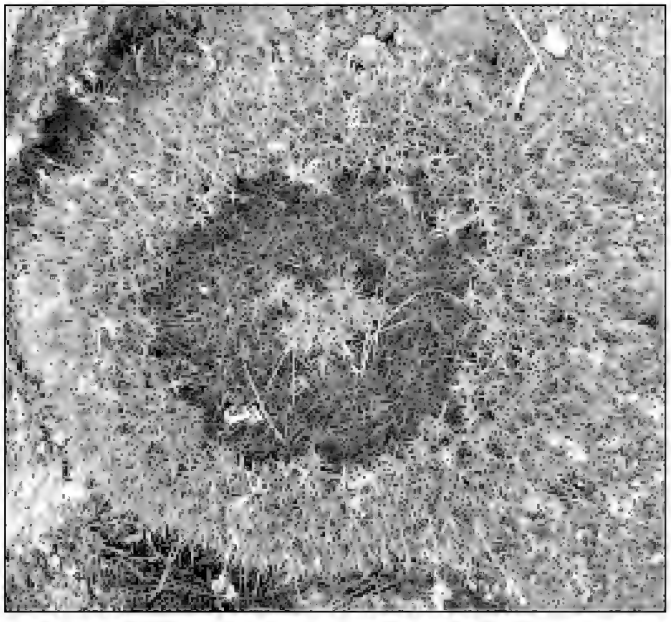
Pine white butterfly on rabbitbrush (*Ericameria nauseosa*), August 28, 2005. Photo by Ron Larson.

FUMARIACEAE (Fumitory Family)
Dicentra uniflora Kellogg (steer's head)
POLEMONIACEAE (Phlox Family)
Collomia grandiflora Douglas ex Lindl. (large flowered collomia)
Collomia linearis Nutt. (narrow leafed collomia)
Collomia tinctoria Kellogg (yellow staining collomia)
Ipomopsis aggregata (Pursh) V.E. Grant (scarlet gilia)
Leptosiphon (*Linanthus*) *bicolor* (Nutt.) Jeps. (bicolored linanthus)
Leptosiphon (*Linanthus*) *ciliatus* (Benth.) Jeps. (wiskerbrush)
Leptosiphon (*Linanthus*) *harknessii* (Curran) J.M. Porter & L.S. Johnson (three-seed linanthus)
Leptosiphon (*Linanthastrum*) *nuttallii* (A.Gray) J.M. Porter & L.S. Johnson (Nuttall's linathastrum)
Linanthus (*Leptodactylon*) *pungens* (Torr.) J.M. Porter & L.S. Johnson (prickly phlox)
Phlox diffusa Benth. (spreading phlox)
Phlox gracilis (Hook.) Greene (slender phlox)
Polemonium occidentale Greene (western Jacob's ladder)
POLYGONACEAE (Buckwheat Family)
Eriogonum elatum Douglas ex Benth. (tall buckwheat)
Eriogonum nudum Douglas ex Benth. (bearstem buckwheat)
Eriogonum spergulinum A. Gray var. *reddingianum* (spurry buckwheat)
Eriogonum umbellatum Torr. (sulphur flower buckwheat)
Eriogonum vimineum Douglas ex Benth. (broom buckwheat)
Oxyria digyna (L.) Hill (mountain sorrel)
Bistorta bistortoides (Pursh) Small (American bistort)
Rumex acetosella L. (sheep sorrel)
PORTULACACEAE (Purslane Family)
Calyptridium (*Spraguea*) *umbellatum* (Torr.) Greene (pussypaws)
Claytonia megarhiza (A.Gray) Parry ex S. Watson (alpine springbeauty)
Lewisia nevadensis (A. Gray) B.L. Rob. (Nevada lewisia)
Lewisia pygmaea (A. Gray) B.L. Rob. (dwarf lewisia)
Lewisia triphylla (S. Watson) B.L. Rob. (threeleaf lewisia)
Montia linearis (Douglas ex Hook.) Greene (narrowleaf montia)
PRIMULACEAE (Primrose Family)
Dodecatheon alpinum (A. Gray) Greene (alpine shooting star)
RANUNCULACEAE (Buttercup Family)
Aconitum columbianum Nutt. var. *columbianum* (Columbia monkshood)
Actaea rubra (Aiton) Willd. (western red baneberry)
Aquilegia formosa Fisch. (red columbine)
Caltha leptosepala DC. (marsh marigold)
Delphinium depauperatum Nutt. (slim larkspur)
Delphinium nuttallianum Pritz. ex Walp. (upland larkspur)
Ranunculus alismifolius Geyer (plaintain leaved buttercup)
Ranunculus populago Greene (mountain buttercup)
Thalictrum sparsiflorum Turcz. ex Fisher & C.A. Meyer (few flowered meadowrue)
RHAMNACEAE (Buckthorn Family)
Ceanothus prostratus Benth. (Mahala mat)
Ceanothus velutinus Douglas ex Hook.(tobacco brush)
Rhamnus alnifolia L'Hér. (alder buckthorn)
ROSACEAE (Rose Family)
Amelanchier alnifolia (Nutt.) Nutt. ex M. Roem. (western serviceberry)
Cercocarpus ledifolius Nutt. (curl-leaf mountain mahogany)
Fragaria vesca L. (wood strawberry)
Fragaria virginica Duchesne (broad petal strawberry)
Geum macrophyllum Willd. (large leaved avens)
Holodiscus dumosus (Nutt. ex Hook) A. Heller (mountain spray)
Horkelia fusca Lindl. (pink pinwheels)
Potentilla glandulosa Lindl. (sticky cinquefoil)
Potentilla gracilis Douglas ex Hook. (graceful cinquefoil)
Potentilla versicolor Rydb. (varying cinquefoil)
Prunus emarginata (Douglas ex Hook) Walp. (bitter cherry)
Purshia tridentata (Pursh) DC. (bitterbush)
Rubus parviflorus Nutt. (thimbleberry)
Sibbaldia procumbens L.(creeping sibbaldia)
Sorbus scopulina Greene (Rocky Mountain mountain ash)
RUBIACEAE (Madder Family)
Kelloggia galoides Torr. (kelloggia)
SALICACEAE (Willow Family)
Populus tremuloides Michx. (quaking aspen)
SAXIFRAGACEAE (Saxifrage Family)
Heuchera cylindrica Douglas ex Hook (roundleaf alumroot)
Lithophragma glabrum Nutt. (smooth fringecup)
Lithophragma tenellum Nutt. (slender woodland star)
Mitella pentandra Hook. (mitrewort)
Saxifraga nidifica Greene (nesting saxifrage)
Saxifraga oregana Howell (Oregon saxifrage)
SCROPHULARIACEAE (Figwort Family)
Castilleja applegatei Fernald (wavy leaf paintbrush)
Castilleja miniata Douglas ex Hook. (scarlet paintbrush)

**Castilleja chlorotica* Piper (green-tinged paintbrush)
Collinsia parviflora Douglas ex Lindl.(small flowered blue-eyed Mary)
Collinsia rattanii A. Gray (Rattan's collinsia)
Mimetanthe pilosa (Benth.) Greene (hairy monkeyflower)
Mimulus guttatus DC. (common yellow monkeyflower)
Mimulus moschatus Douglas ex. Lindl. (musk monkeyflower)
Mimulus nanus Hook. & Arn. (dwarf monkeyflower)
Mimulus primuloides Benth. (primrose monkeyflower)
Pedicularis groenlandica Retz. (elephant's head pedicularis)
Penstemon davidsonii Greene var. *davidsonii* (Davidson's penstemon)
Penstemon deustus Douglas ex Lindl. (hotrock beardtongue)
**Penstemon glaucinus* Pennell (blue leaved penstemon)
Penstemon laetus A. Gray var. *roezlii* (Roezli's penstemon)
Penstemon rydbergii A. Nelson (Rydberg's penstemon)
Synthyris missurica Pennell (western mountain kittentails)
Veronica wormskjoldii Roem. & Schult. (American alpine speedwell)
SOLANACEAE (Nightshade Family)
Leucophysalis nana (A. Gray) Averett (dwarf chamaesaracha)
VALERIANACEAE (Valerian Family)
Valeriana californica A.Heller (California valerian)
Valeriana occidentalis A.Heller (western valerian)
VIOLACEAE (Violet Family)
Viola glabella Nutt. ex Torr. & A. Gray (stream violet)
Viola macloskeyi Lloyd (small white violet)
Viola purpurea Kellogg (goosefoot violet)
Viola vallicola A. Nelson (yellow valley violet)

MONOCOTYLEDONS

CYPERACEAE (Sedge Family)
Carex fracta Mack. (fragile-sheathed sedge)
Carex inops L.H. Bailey (long-stolon sedge)
Carex jonesii L.H. Bailey (Jones' sedge)
Scirpus microcarpus J. Presl & C. Presl (small-fruited sedge)



Common on dry, pumice- or rock-dominated soils, prickly sandwort (*Arenaria aculeata*) forms a ring as the plant grows outward after the inner part dies. Photo by Ron Larson.

IRIDACEAE (Iris Family)
Iris missouriensis Nutt. (western blueflag)
Sisyrinchium idahoense E.P. Bicknell (Idaho blue eyed grass)
JUNCACEAE (Rush Family)
Juncus mertensianus Bong. (Mertens' rush)
Juncus orthophyllus Coville (straight leaved rush)
Luzula multiflora (Ehrh.) Lej. ssp. *multiflora* (common woodrush)
Luzula spicata (L.) DC. (spiked woodrush)
LILIACEAE (Lily Family)
Allium campanulatum Wats. (Sierra onion)
Allium tolmiei Baker var. *tolmiei* (Tolmie's onion)
Allium validum S. Watson (swamp onion)
Fritillaria atropurpurea Nutt. (chocolate lily)
Fritillaria pudica (Pursh) Spreng. (yellow bell)
Lilium washingtonianum Kellogg (Washington lily)
Maianthemum (*Smilacina*) *racemosum* (L.) Link (western Solomon plume)
Maianthemum (*Smilacina*) *stellatum* (L.) Link (starry false Solomon's seal)
Triteleia (*Brodiaea*) *hyacinthina* (Lindl.) Greene (hyacinth brodiaea)
Veratrum californicum Durand (California false hellebore)
ORCHIDACEAE (Orchid Family)
Corallorhiza maculata (Raf.) Raf. (spotted coralroot)
Goodyera oblongifolia Raf. (western rattlesnake plantain)
Listera caurina Piper (northwest twayblade)
Piperia unalascensis (Sprengel) Rydb. (Alaska rein orchid)
Platanthera dilatata (Pursh) Lindl. ex Beck var. *leucostachys* (Lindl.) Leur (white bog orchid)
Platanthera sparsiflora (S. Watson) Schltr. (sparse flowered bog orchid)
Platanthera stricta Lindl. (slender bog orchid)
Spiranthes romanzoffiana Cham. (hooded ladies tresses)
POACEAE (Grass Family)
Achnatherum occidentale (Thurb. ex S. Watson) Barkworth (western needlegrass)
Agrostis scabra Willd. (winter bentgrass)
Bromus carinatus Hook.& Arn. (California brome)
Bromus orcuttianus Vasey var. *orcuttianus* (Orcutt's brome)
Deschampsia danthonioides (Trin.) Munro (annual hairgrass)
Elymus elymoides (Raf.) Swezey (bottle brush squirreltail)
Melica bulbosa Geyer ex Porter & J.M. Coult. (oniongrass)
Muhlenbergia filiformis (Thurb. ex S. Warson) Rydb. (pullup muhly)
Phleum alpinum L. (mountain timothy)
Poa secunda J. Presl (Sandberg bluegrass)

Ron Larson received a BS from Oregon State University in 1969, and advanced degrees from universities in Canada and Puerto Rico. He is an aquatic biologist with the US Fish and Wildlife Service in Klamath Falls. Ron is a member of the Klamath Basin Chapter of NPSO and has led field trips including some to the Gearhart Mountain Wilderness. He is one of the coauthors of the recently-published book, *Common Plants of the Upper Klamath Basin*. Ron enjoys all aspects of native plants, including photography, gardening, and their identification. He spends his winters dreaming of mountain meadows filled with flowers and buzzing with bees.

Blue Flower of Tribal Legend: "Skye blue petals resemble lakes of fine clear water"

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and H. Peter Eilers, Department of Earth Science,
Willamette University, Salem, OR 97301

Today wild camas still creates a "blue skye" near Weippe prairie, in populations now fragmented by human occupation and land use (*C. quamash* subsp. *quamash* in flower and fruit). Photos courtesy of James Reveal.

First in importance as a wild food, camas
grow in the wet mountain meadows, bloom
blue in the early hot season.
Do not pass over the camas root in silence.
–From a contemporary poem by Gloria Bird (2002)

When camas flowers in mountain meadows and in the open prairies of the Willamette, Umpqua, and Rogue valleys, it creates a spectacular sky blue display that reminds us of its rich history of use by native people. Historically and today, one cannot "pass over" the early spring flowers without proclaiming their beauty, nor dig the bulbs "in silence," as harvesting them "gently" from the earth is "an all day job hard on the back" (Bird 2002). Once plentiful, common camas (*Camassia quamash*) and great camas (*C. leichtlinii*) supplied native Northwest peoples with a staple food and valuable trade commodity. Cultivation and trading expanded its natural geographic range, while burning sustained traditional harvest grounds in oak savannas and prairies. Today, where these habitats have been degraded or lost, camas populations have disappeared. Although some grassland restoration efforts are reintroducing *Camassia* as a foundation species, additional research and greater public awareness are needed to foster more widespread restoration. The cultural uses, botanical traits, and geography of two abundant camas species create an intriguing story and justification for future conservation efforts.

Historical Roots

Make a pit for baking.
This earth oven will hold them
The way mothers hold the child within. (Bird 2002)

According to archeological evidence, ancient camas ovens and charred bulbs in the Willamette Valley date back 7,750 years (Aikens 1993). Ovens unearthed near Eugene measure six feet in diameter and include baking stones and the remains of cooked camas. Camas bulbs were steamed in an earthen pit, with heated stones underneath, and vegetation such as grand fir (*Abies grandis*), ash (*Fraxinus*), willow (*Salix*), kelp blades, skunk cabbage (*Lysichiton americanum*) and sword fern (*Polystichum munitum*) layered over the camas. Tribal members formed a channel to pour water into the pit, creating steam that slow-cooked the bulbs for 24 to 36 hours, until they became soft and sweet (Turner and Kuhnlein 1983).

Ancient legends and the presence of camas at feasts and potlatches underscore its cultural value. In the legend from several tribes along the Columbia River, "*How Coyote Helped the People,*" coyote planted berries, camas and other roots, teaching people how to survive (Clark 1953). Similarly, in a Wasco legend, "*The Origin of the Root Festival,*" fox brings roots and bulbs down to the earth with these instructions, "When you begin to dig the roots in the spring, you will sing and dance and give thanks to the Great Spirit." An Okanogan legend tells the story of Blue Flower, a young Kalispel girl, who prevents two quarreling suitors of a rival Okanogan tribe from acquiring her basket of bulbs: "She wanted no camas to grow in the valley of the Okanogan people" (Clark 1953). Camas was so important to native people that wars were fought over it in the 1870s. Tribes on reservations without food clashed with settlers who were feeding large hog herds on camas prairies set aside, under US government treaty, for traditional use by native people (Smith 1978).

Camas also played a pivotal role in the Lewis and Clark expedition. In the fall of 1805, after a difficult journey across the Bitterroot Mountains (now the Montana-Idaho border), the expedition party survived on camas bulbs shared by the Nez Perce. On their return trip east in the spring of 1806, Lewis and Clark again camped with the Nez Perce, collecting the type specimen of *Camassia* from "Quawmash flats," (Weippe Prairie in present Clearwater County, Idaho) (Gould 1942). Both Lewis and Clark wrote about camas in their journals, documenting details of morphology, preparation, and dietary importance. Lewis marveled at the magnificent blue color: "the quawmash is now in blume and from the colour of its bloom at a short distance it resembles lakes of fine clear water."

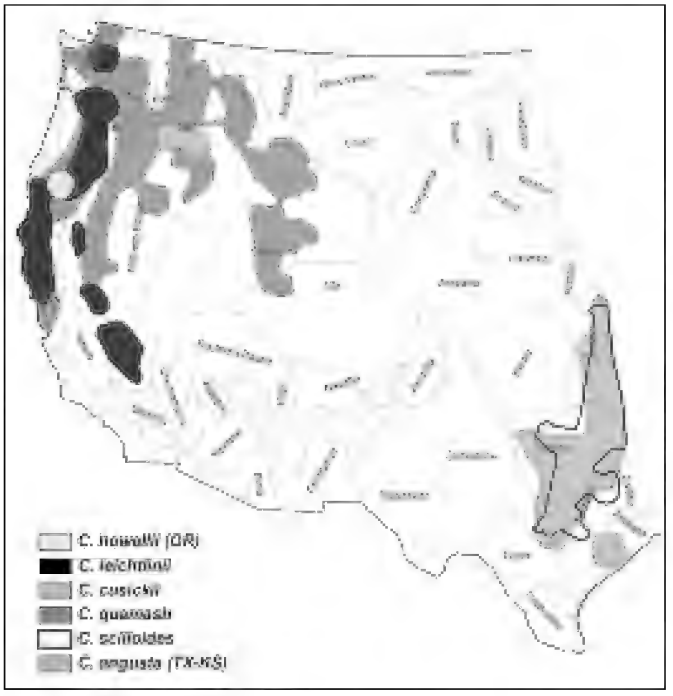
What's in a Name?

The English word "camas" originated from the Nez Perce word "*qém'es,*" (as documented by Lewis and Clark) along with "*quamash,*" "*quawmash,*" and "*pas-shi-co root*" (Hartley 2001). Many other western Indigenous dialects include words for "camas" whose meanings reflect habitat, flavor, or the onion-like form. For example, the Shoshoni of the Snake River, Idaho, called "camas" "*pa-siko,*" meaning "water sedge-lily" (Hartley 2001). In 1803-1805, the English blacksmith John Jewitt recorded words

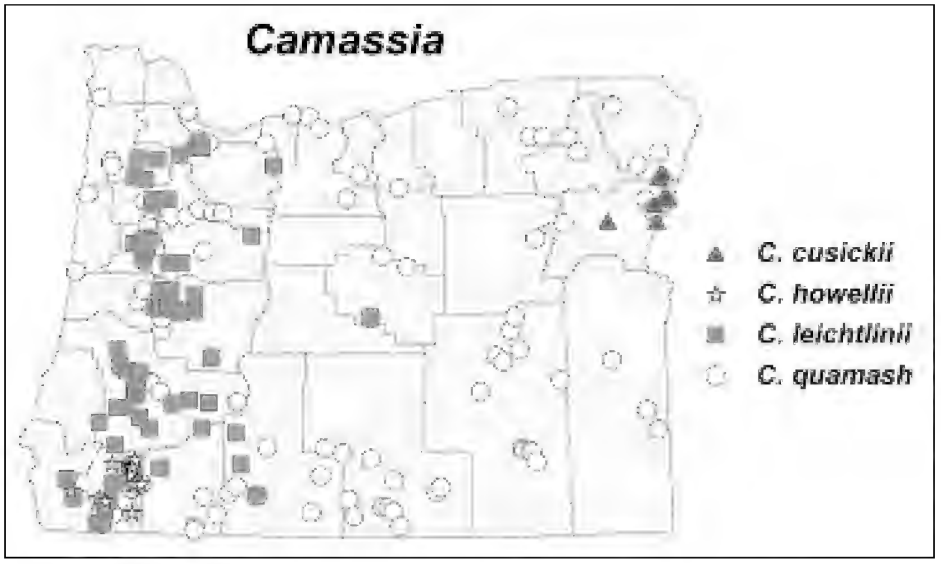
Wild camas bulbs have a characteristic black tunic surrounding the white, onion like, fleshy leaves. Photo by James Reveal.

of his Nuu-chah-Nulth captors that sounded similar to "camas," including "*cha-mass*" for fruit and "*cha-mas-sish,*" for sweet taste (Hartley 2001). Other common names for *C. quamash* include "Siwash onion" and "swamp sego." Common names are notoriously problematic in plants, however, and "camas" is no exception as it sometimes refers to plants of *Lomatium* in the carrot family.

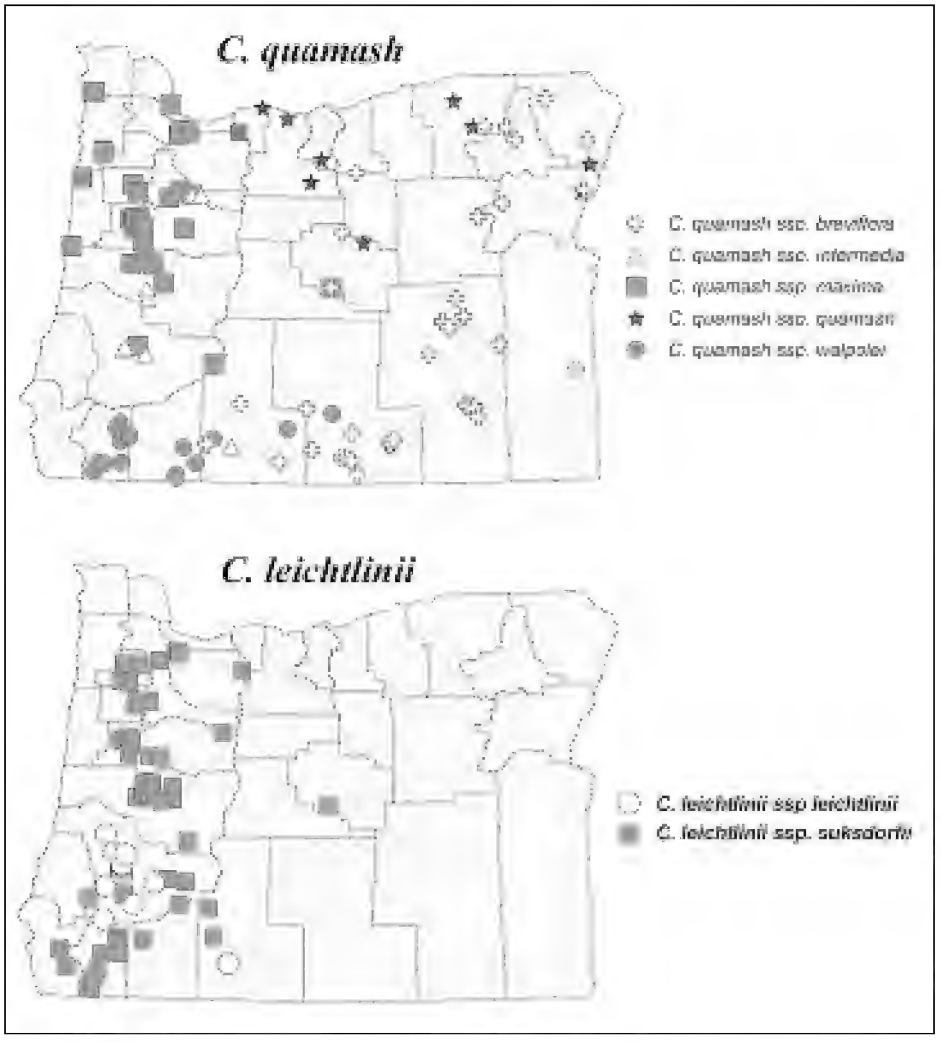
Traditionally, botanists classified *Camassia* in the Liliaceae with garden plants *Scilla* and *Hyacinthus,* close to the soap plant *Chlorogalum* (Gould 1942). In recent DNA analyses, *Camassia* and *Chlorogalum* remain well supported as sister taxa but are now classified in the Agave family with *Yucca* and *Agave* (Pfosser and Speta 1999). These lineages of Agavaceae *sensu stricto* also include species that share similar chromosome numbers (2n or n = 30) and a bimodality in size, with three to five large as well as



Many western and midwestern tribes lived within range of the six North American *Camassia* species (see page 31 for detail of tribes in Oregon). Tribes encountered the greatest diversity of these species in the Oregon territory. Map based on W. Beck and Y. Haase, 1989, *Historical Atlas of the American West.*



The geographic distribution of the four western species of *Camassia* span the entire state of Oregon, with a "hot-spot" of diversity in southwestern Oregon, likely reflecting the varied topography and geologic landscapes of this complex region. Maps were created using updated files obtained from the Oregon Flora Project at OSC.



In Oregon, *C. leichtlinii* is largely limited to the western slopes and valleys whereas *C. quamash* occurs from the western coast to the eastern plains. At least five subspecies of common camas occur with regularity in Oregon. Oregon Flora Project Database at OSC.

numerous small chromosomes (Bogler and Simpson 1996).

Several morphological features of *Camassia* species differ from those of their close relatives: chestnut brown bulbs partially covered by a coarser black tunic; keeled basal leaves; racemes of typically blue to purple flowers with six tepals; and dry, capsular fruits with shiny black seeds (Ranker and Hogan 2002; Kozloff 2005). *Camassia* exhibits high variability in seed number per locule with up to twelve seeds compared to one to two seeds per locule in *Chlorogalum* (Gould 1942).

Distinguishing among *Camassia* species

Of six North American species of *Camassia*, four (*C. cusickii, C. howellii, C. quamash,* and *C. leichtlinii*) occur in western North America. Among the four camas species in Oregon, two are abundant and widespread and two are restricted to small geographic regions. *Camassia cusickii* occurs in northeastern Oregon (see related article on Wm. Cusick by Rhoda Love) and *Camassia howellii* is limited to southwestern Oregon. The two abundant species, *C. quamash* and *C. leichtlinii* range from British Columbia south to California and share similar habitats. Native people likely did not differentiate between them when harvesting bulbs (Turner and Kuhnlein 1983), although differences in flowering times may have influenced harvest dates, and bulb size or flavor may have prompted preferential trading or gathering of one species over another (Beckwith 2004). *Camassia quamash* is the most widespread and variable, with eight subspecies (Ranker and Hogan 2002). It reaches its greatest diversity in Oregon; at least five subspecies occur in 29 of the 36 counties. A sixth subspecies, *utahensis*, is known from only two herbarium specimens in the Oregon Flora Project Database 2006.

Camassia species differ in bulb form and clustering, flowering time, plant size, and floral traits, including symmetry, number of tepal veins, curvature of the fruiting pedicel, and withering pattern of tepals (Ranker and Hogan 2002). In bilaterally symmetric

C. quamash ssp. *quamash*, as W. Clark notes so precisely in 1806: "the corolla consists of five long oval obtusely pointed Skye blue or water coloured petals…five of them are placed near each other pointing upwards while one stands horizon[tally], or pointing downwards." Each tepal withers separately, and the pedicels often curve inward, placing the fruits close to the stem (Ranker and Hogan 2002; Kozloff 2005). In contrast, *C. leichtlinii* flowers are consistently radially symmetric, with tepals that wither together around the ovary. Great camas plants are taller than common camas, and also have larger bulbs, leaves, and flowers (Gould 1942; Ranker and Hogan 2002). Where great camas grows with *C. quamash* ssp. *maxima,* common camas flowers two to three weeks earlier (mid-April at low elevations). Reproductive barriers exist between these two species, and protein studies show that they also differ genetically (Uyeda and Kephart 2006).

Camas Habitat: White Oak Savannas to Wet Prairies

Camassia quamash and *C. leichtlinii* occur together in seeps, wet prairies, and along streams and riverbanks west of the Cascade Range in Oregon. White oak savanna provides important habitat from southwestern British Columbia to northern California, including along Oregon's coast and western interior valleys. A feature of the Willamette Valley for at least 6,000 years (Boyd 1999), this ecosystem is characterized by a mild climate, abundant herbaceous vegetation, and mollisols (soils rich in organic matter that develop under grasslands). Where *C. quamash* and *C. leichtlinii* grow in sympatry, common camas usually occurs in full sun whereas great camas prevails in partial to full shade, beneath oaks or with ash and cottonwood along streams. Recent studies at Willamette University demonstrated that these species differed in germination and survival under varied temperatures and water levels, but both species thrive in basaltic soils that are winter-wet and summer-dry. Sandy or silty loams are ideal, but plants also grow in well-drained, gravelly, alkaline soils to heavier clays and silts (Stevens *et al.* 2001). Bulbs tolerate shallow soils as well as deeper soils limited by anoxia, shallow water tables, or impenetrable layers (Russell 2001).

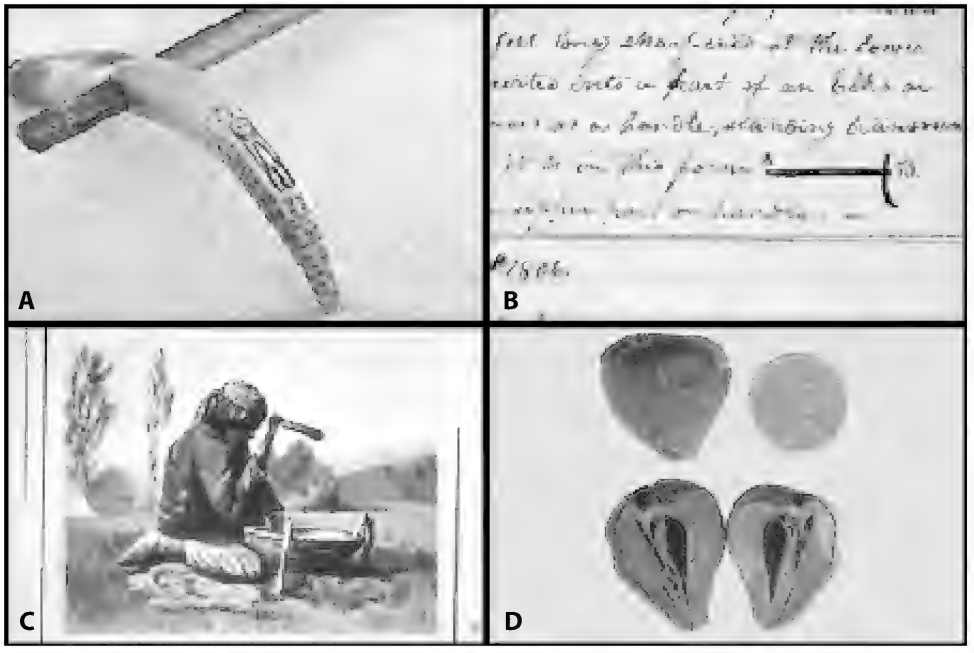
Ethnobotany

Camas are a small white onion
when removed from the earth.
When prepared for food
they turn black and sweet… (Bird 2002)

Camas held cultural, food, and medicinal value for diverse Oregon tribes including the Chinook, Kalapuyans, Klamath, Modoc, Nez Perce, Northern Paiute, Columbia River Sahaptins, and Takelma. Bulb digging and berry picking were important rites of passage for girls of the mid-Columbia region whose first basket of bulbs or fruits culminated in a tribal celebration recognizing her transition to adulthood (Hunn *et al.*1990). At wedding feasts native people traded cornhusk bags filled with bulbs or roots including camas, biscuit-root (*Lomatium caruifolium*) and bitterroot (*Lewisia rediviva*) (Van Allen Murphy 1958).

Distribution of Pacific Northwest Tribes in Oregon in the mid-1850s when Euro-American settlement curtailed traditional burning. Map based on W. Long, S. Allen, A. Buckley, and J. Meacham, 2001, *Atlas of Oregon*.

Native people consumed and stored large quantities of both species of camas. The bulbs were dipped in whale oil and eaten with meat or fish or dried and made into cakes for winter use (Turner and Kuhnlein 1983). *Camassia quamash* formed the basis for "bread," gravy, soup, and a sweet beverage (Moerman 1998). Dried camas cakes, the most valuable form, ranged in size from delicate finger foods to loaves of about 10 lbs (Juntunen *et al.* 2005). Camas provided protein as well as carbohydrates to the diet; biochemical analysis suggested that at 7% protein, camas bulbs were a slightly better source than acorns (2.9-6.3%) (Anderson 2005). Cooking greatly improves the texture, nutritive value and flavor of camas. After eating raw camas (white, slimy, glutinous), members of the Lewis and Clark expedition likened them to the taste of soap, but as Gloria Bird noted, *"better to have roots than complain and have no food."* Raw bulbs contain inulin, a complex, and largely indigestible sugar. Steaming in earth ovens converts inulin to fructose, a sweet, simple sugar. Konlande and Robson (1972) reported that raw camas bulbs contain only 0.5%



Photographs of digging sticks used for bulb extraction A) by the tribes of the Plateau cultures (Oregon Historical Museum 2002); B) in the time of Lewis & Clark (American Philosophical Society 2005). C) Nez Perce woman pounding camas (Gay 1889-1892). D) pit-baked camas bulbs. Photo by J. Agee.

reducing sugar compared to 43% in cooked bulbs. Various authors liken the consistency of cooked camas to roasted onions, the color to molasses, the flavor to fig or baked pear, the odor to vanilla, and the taste to maple sugar or sweet chestnut.

Common camas had several medicinal uses. The Blackfoot tribes of Montana and Alberta made a tea from its leaves to initiate labor, control postpartum bleeding, and expel the placenta (Moerman 1998; Foster and Hobbs 2002). The Nez Perce prepared a cough medicine by boiling camas bulbs and adding honey to the resulting juice.

The Oregon Camas Harvest

Oregon tribes harvested camas in prairies north of the John Day River, in the Grande Ronde Valley, and along the Umpqua River (Farmer and Holmes 1973). In southwestern Oregon, the slopes of the Table Rocks near Medford in Jackson County were a source of *C. leichtlinii*. Camas bulbs were second only to acorns in importance to the Takelmas of the upper Rogue River (Reyes 1994).

For most western tribes the camas harvest was a seasonal and communal activity with specific gender-related roles (Gilman and Ronda 2003). Seasonal camas harvests occurred during or after flowering, but often lasted many weeks, or months, as is documented for the Nez Perce (Stevens *et al.* 2001). Kalapuyans of the Willamette Valley harvested camas shoots or bulbs nearly continuously from March to June, before the late summer berry crops ripened. As with roots and berries, women and children assumed the role of harvesting camas bulbs; men collected firewood and branches and helped cook the camas in earthen pits (Van Allen Murphy 1958; Suttles 2005). Extracting camas from the ground without breaking the bulbs required skill and considerable effort. The fire-hardened digging stick was a sharp piece of wood with an elk or deer antler for a handle. Crafted by a woman (or by her husband), it was bequeathed to family members after her death (Gilman and Ronda 2003).

Annual camas harvests provided opportunities for intertribal trade and socialization at potlatches and feasts. For this reason, women collected camas in larger quantities than they needed for their own families or tribal unit. Nez Perce women typically gathered 50 to 60 pounds a day, with records as high as 80 to 90 pounds (Gilman and Ronda 2003). After harvest, Kalapuyans boiled young camas shoots for immediate consumption, cooked and sun-dried the bulbs, or ground them with mortar and pestle into flour to make porridge, cakes, or bread for the feasts. First food feasts celebrating plant foods were more common than those giving thanks for animal foods (Hunn *et al.*1990), and a poem by Gloria Bird (2002) reflects the cultural importance of camas.

Remember, granddaughter,
the dried camas will keep
a long time. Always thank
it for giving itself to you.

Intertribal Trade

"I am going to put bitterroot and camas and other roots in different parts of the country." (fox in Yakima legend, Clark 1953)

Although camas was abundant in the Pacific Northwest, its restricted distribution in some areas and the familial ownership of certain meadows fostered an extensive trade network in the northern Great Basin region (Statham 1982). Nez Perce tribes in northeastern Oregon and nearby Washington and Idaho traded camas to the Warm Springs, Umatilla, Cayuse, Walla Walla, Nespelem, Yakama, Crowes, and Flathead (Stevens *et al.* 2001). Camas trade was associated with special occasions: weddings, funerals, and the annual harvest. Kalapuyans gave camas to coastal tribes in exchange for delicacies such as dried salmon, clubs made from whalebone, and items decorated with shells. This trade may have expanded the natural range of camas. Lewis noted (11 June 1806): "in the Columbian Vally and near the coast [camas] is to be found in small quantities and inferior in size to that found in [Weippe Prairie]..." Tribes without large populations of camas probably transplanted bulbs to their areas; e.g., the Tillamook near the northern coast of Oregon (Lepofsky *et al.* 2005). Alternatively, coastal camas populations could represent natural refugia, for example, common camas in peat bogs at Bamfield, on Vancouver Island (N. Turner, pers. comm.).

Camas cultivation dates back thousands of years

Native people modified the natural habitat of camas by tilling, fertilizing (with ash and seaweed), weeding, and periodically

burning meadows; they also selectively gathered large bulbs while replanting small bulbs for future harvest (Anderson 2005; Turner and Peacock 2005). When the harvest occurred after fruiting, populations were sustained by camas seeds that fell into freshly dug ground.

Present day habitats and geographic variation in native camas were undoubtedly shaped by transplanting, intentional burning, selective harvesting, inter-tribal trade, and tribes being forced to live on small reservations. Of these practices, the consequences of burning the landscape were likely the most profound. Charcoal in lakebed cores in the Willamette Valley indicate that landscape-wide fires created a mosaic of open prairies and oak savannas (favorable camas habitat) more than 2700 years ago (Boyd 1999; Lepofsky *et al*. 2005). In response to a cooling trend three to four thousand years ago that favored coniferous vegetation, tribes along the Pacific coast began burning the prairies. When traditional burning ended, the once-thriving camas populations declined, and shrubs and conifers reinvaded the prairies (Wray and Anderson 2003).

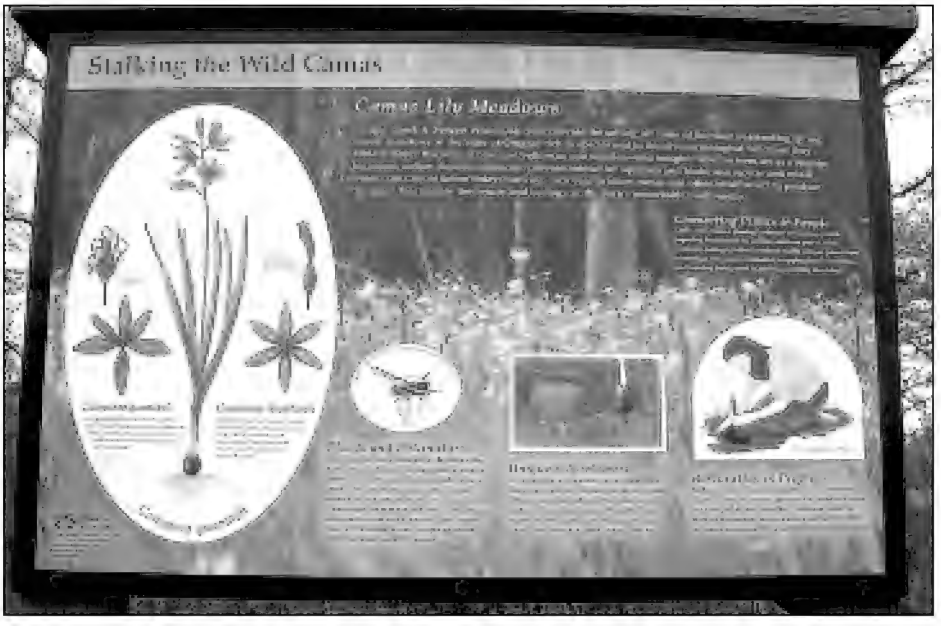
In Oregon, Kalapuya tribes regularly set fires during late summer and early fall to maintain oak savanna communities in the Willamette Valley (Boyd 1999). At Huckleberry Mountain, just west of Crater Lake (Douglas County), burning maintained not only berry patches and seasonal campsites, but also camas and other early successional plants and animals used by Klamath tribes (Deur 2002). *Camassia*, entering a period of dormancy during summer, survived summer and fall burns, and benefited from reductions in woody plant cover.

Conservation: Protecting and Restoring Camas Prairies

In the last two centuries, humans have drained wetlands and meadows for agriculture, controlled floods in riparian corridors, and converted prairies and oak savannas to crops, livestock pastures, and urban development. Camas prairies once sustained by native tribes have disappeared or currently risk extinction (Turner and Kuhnlein 1983; Wilson 1998). Federal and state statutes provide some protection for wetlands, which support camas, but 29% of native wetlands in Oregon are "imperiled," including Willamette Valley wet prairie (Morlan 2000). Fortunately, the adaptability of camas to a variety of environments and the relative ease with which it can be propagated facilitates restoration of degraded habitats. From seed, *Camassia* may flower within four years; bulb reintroductions in mitigated wetlands in Salem, Oregon, produced new seedlings within two years. Experimental camas populations in British Columbia remained stable under four years of weeding, size-based bulb harvesting, and burning, except in one population under xeric conditions (Beckwith 2004). In the San Juan Islands, the response to experimental burning was complex, as *C. leichtlinii* increased in abundance in burn plots over control plots in only two of three years (Dunwiddie 2006). We still have much to learn about habitat requirements of both camas species and their responses to restoration techniques. Detailed field research, including experimental trials, provides information for active resource management, both for preserving healthy camas populations and augmenting habitat restoration efforts. An understanding of the cultural history of camas may also lend insights that will improve future conservation practices.

Among the diversity of seeds, fruits, bulbs, and shoots harvested by the earliest inhabitants of Oregon, camas was integral to diet, commerce, and ceremonial practices (Garibaldi and Turner 2004). Protecting healthy camas populations and their associated ecosystems (prairies, riparian corridors, and white oak savannas) should be a conservation priority. Future generations should be

Earthwatch Institute staff and volunteers remove invasive Scot's broom (*Cytisus scoparius*) from mesic prairie sites that support the growth of wild camas. Photo by Susan Kephart.



Education and restoration efforts are critical to maintaining existing populations and to restoring existing habitat. Illustrations contributed by Andrea Foust Carlson with the support of Salem Public Works Watershed Grants Program. Photo by Susan Kephart.

able to gaze across these extraordinary blue landscapes and contemplate the traditional ecological practices that preserved camas and sustained native tribes.

Acknowledgements

We extend special thanks to Nancy Turner for many helpful comments. Ed Alverson, Brenda Beckwith, Rebecca Dobkins, Barbara Lane, Rhoda Love, Katie Mitchell, Frank Lang, and Cindy Roché also provided information or comments that improved this paper.

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Deciphering a Diversity of Wild Camas

The distributions of *Camassia* span a wide altitudinal and latitudinal range in Oregon. According to the Oregon Flora Project database (2006), *C. leichtlinii* is widespread west of the Cascade Mountains, unlike common camas, *C. quamash,* which grows throughout Oregon. Among subspecies of *C. quamash*, subsp. *maxima* is prevalent in the western valleys and hills while subsp. *breviflora* dominates eastern Oregon sites, growing as high as 7,500 feet on Steens Mountain. The extensive, often confusing, subspecific variability of *C. quamash* merits closer morphological and molecular study, as is evident from the complex keys and descriptions in both Flora of North America (Ranker and Hogan 2002) and in Gould's classic 1942 revision. Until phylogeographic analyses are complete, field enthusiasts will need to rely on combinations of simple traits to accurately identify camas, as noted below. Geography definitely helps!

Northeast Oregon Here visitors may encounter either the sometimes gargantuan *C. cusickii*, or several subspecies of common camas (*C. quamash* subsp. *breviflora*, *quamash*, and possibly *utahensis*, in order of prevalence). In Cusick's camas, the base of each plant typically bears multiple clusters with 10 or more wide leaves (≥ 2 cm), compared to the single clusters of fewer, narrower leaves of common camas. Flowers of all of these taxa are variably irregular to zygomorphic in symmetry, but subsp. *quamash* has violet to brown anthers and separate tepal withering whereas subsp. *breviflora* (with bright yellow anthers) and *utahensis* (dull yellow to violent anthers) have connivent tepals that wither together after flowering.

Southeast Oregon: Except for the occasional "drifter" from southwest Oregon, field seekers of camas will likely only encounter *C. quamash* subsp. *breviflora* (described above) in Malheur, Harney, and Lake counties.

Northwest Oregon (Lane county northward): In this region, the blue-flowered common camas, *C. quamash* and great camas, *C. leichtlinii* subsp. *suksdorfii* overlap extensively. These species are readily distinguished by the smaller stature and flower size, bilateral symmetry, and separate tepal withering of the two subspecies of *C. quamash* found in this region, *maxima* and *intermedia.* These two subspecies are similar and their traits warrant additional study, but current taxonomic treatments use the pale tepal color, bright yellow anthers, and strongly incurving fruits of the less common *C. quamash* subsp. *intermedia* to differentiate it from subsp. *maxima* whose flowers vary in coloration, but are often deep blue to purple, have duller colored anthers, and are borne on pedicels with fruits that are appressed or spreading relative to the axis of the flowering stalk.

Southwest Oregon: This region hosts spectacular diversity, with all species of camas present except *C. cusickii*. Two species, *C. leichtlinii* and *C. howellii,* exhibit radial symmetry as well as connivent tepals that may become deciduous as the capsular fruits mature. After observing these plants in the wild, however, it is clear that the species are quite distinct. In sympatric populations, Howell's camas flowers later in the season, and its axes are adorned with numerous and delicate quarter-sized flowers whose ovaries mature into shiny, nearly globose capsules, in contrast to the larger flowers and dullish, more elongate fruits of great camas. The corolla of the second subspecies of great camas in this region, *C. leichtlinii* subsp. *leichtlinii* (Douglas County) is creamy white.

Four subspecies of *C. quamash* occur in southwestern Oregon. Subspecies *breviflora* is easily separated from *C. leichtlinii* and *C. howellii* by its typically zygomorphic corolla. Two additional bilaterally symmetric subspecies of *C. quamash* described already for northwest Oregon (*intermedia, maxima)* also occur here but, unlike subsp. *breviflora*, show the usual separate tepal withering of *C. quamash*. However, flowers of the narrowly distributed *C. quamash* subsp. *walpolei* are radially symmetric and might be confused with *C. leichtlinii* or *C. howellii* except in fruit as subsp. *walpolei* has both separately withering tepals and strongly appressed fruits.

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Molly L. Sultany is an undergraduate student pursuing a biology major at Willamette University in Salem, Oregon. Her interest in botanical sciences developed under the guidance of Professor Susan Kephart, who introduced Molly to *Camassia* research. In her hometown of Portland, Oregon, Molly is an avid volunteer in the education department at the Audubon Society of Portland. She plans to obtain a masters degree in teaching and become a science educator. Her passion for the environment is reflected by her love of camping, kayaking, and bird watching.

Dr. Susan R. Kephart is a Professor of Biology at Willamette University. Her research focuses on the reproductive biology, species boundaries, and patterns of hybridization in the genera *Asclepias, Camassia,* and *Silene*. She is actively working with undergraduate students, Earthwatch volunteers, and other professionals to restore native species to human altered landscapes that were historically present in prairies and wetlands. She and her husband Jim enjoy canoeing, hiking in coastal and montane areas, and anything that involves chocolate labs.

Dr. Peter Eilers is Professor of Geography and Environmental Studies at Willamette University. As a biogeographer, his research has focused on salt and freshwater wetlands with an emphasis on computer mapping and geographic information systems. He lives in Corvallis with his wife Kay and a samoyed named Sol.

NPSO Fellows

In 1998 Veva Stansell brought the idea to Native Plant Society of Oregon Board to honor individuals for outstanding service to the society. The Board voted to recognize Fellows of our Society, an accolade used by the California Native Plant Society. Since 1998 we have honored eighteen individuals with this, our highest award: John Robotham, Keith Chamberlain, and Ruth Hanson in 1998, Kenton Chambers and Wilbur Bluhm in 1999, Karl Urban and Frank Lang in 2000, Charlene Simpson, Veva Stansell and Rhoda Love in 2001, Jerry Igo in 2002, and Charlene Holzwarth and Russ Jolley in 2003. This year, 2007, five outstanding women received Fellows awards: Barbara Robinson, Joan Fosback, Mildred Thiele, Lois Hopkins and Mary Carlson.

Prospective Fellows may be nominated by individual NPSO members, by chapters, or by the State Board. Fellows must have contributed outstanding service to NPSO or to the cause of plant conservation in Oregon. The nomination is brought to the NPSO State Board for approval, and the recipient is then honored at the next Annual Meeting, presented with a handsome plaque, and featured in an article in *Kalmiopsis*. Fellows also receive a Life Membership in NPSO. *–Rhoda Love, NPSO Fellows Committee.*

Barbara Robinson

Barbara Robinson. Photo by Kareem Sturgeon, 2006.

When Barbara Robinson first saw the oak/pine area of the Columbia Gorge, she knew she had found home. Born in Chicago, Illinois, Barbara came west to attend Reed College in Portland, finishing a joint major in psychology and philosophy in 1970. In 1972 she completed a MS in psychobiology from the University of California, Irvine. She taught psychology at Portland Community College for thirty years and retired in 2001. She also taught introductory biology and psychology at Columbia Gorge Community College in The Dalles.

Fruits of Barbara's inexhaustible passion for conserving her beloved Gorge began with creation of the Tom McCall Preserve. In 1978, after four years of effort, she purchased and sold to the Nature Conservancy the first parcel of land (34 acres). In 1985 she raised the funds to buy a third parcel (64 acres) that included McCall Point. With the Mazamas, she helped lay out and build a trail there.

In 1986 she worked to get the Rowena Special Management Area included in the Columbia Gorge National Scenic Act. This allowed further land purchases with federal money of the Memaloose and the Seven Mile Hill areas. She planted native plants at the Mosier interchange, and was one of many who helped Russ Jolley plant and weed at milepost 68 on Interstate 84. Later she and Russ convinced the Forest Service to buy the property that later became the Memaloose Trail.

On the Washington side of the Gorge, she lobbied the Forest Service to purchase property east of Coyote Wall, where Keith Chamberlain (NPSO fellow in 1998) led many NPSO spring wildflower hikes. In 1988 Barbara was the catalyst for Nancy Russell's first purchase of land for conservation in the Memaloose area; many other purchases followed. Barbara then spent several years convincing the Forest Service to buy land in the Rowena Dell, a magnificent canyon next to the Rowena Plateau. She also wrote many letters to many private landowners calling attention to the beauty and scenic value of their properties, leading to sale of property to the Forest Service for conservation. Next, she joined three others to conduct a rare plant survey for the Klickitat River, which had been designated Wild and Scenic. Her initial interest in the Klickitat River area near Lyle, Washington, led to involvement in the 31-mile Rails-to-Trails conversion for biking and hiking in 2002. At that time there was a possibility that Washington State Parks would cede the public land to private ownership. Both State Parks and the Forest Service now share management, but the County still opposes the trail. She is currently vice president of the Klickitat Trail Conservancy, the group dedicated to preserving and enhancing natural values along the trail, including botanical qualities. Every week brings a new crisis or frustration, but the group has achieved a functional trail. Other conservation efforts have included the Chenoweth Trail and the Seven Mile Hill Trail near The Dalles, Oregon. She is still trying to negotiate land purchases in that area.

Over the years, Barbara has led many hikes for NPSO, Friends of the Columbia Gorge, Columbia Gorge Community College and Elderhostel. She now resides in Mosier, where she has contributed thousands and thousands of hours toward conservation and restoration of native plants and habitats. Her love of the Gorge has truly made a difference for future generations.

–Leslie R. Labbe, Portland Chapter.

Douglas County's Little Old Ladies in Hiking Boots: Lois Wesley Hopkins, Mildred Thiele, Joan Fosback, and Mary Carlson

This is the story of four Douglas County women, self-proclaimed "Little Old Ladies in Hiking Boots," whose passion for native plants placed their county at the forefront of the Oregon Flora Project. The four women, Lois Wesley Hopkins, Mildred Thiele, Joan Fosback, and Mary Carlson, founded the herbarium at the Douglas County Museum of History and Natural History, without any formal education in botany. In 1994, the US Department of Agriculture presented the four with a certificate "in recognition and appreciation for the outstanding commitment and dedication to the identification of the flora of Douglas County." After decades of devoted volunteer work, the four women knew Douglas County plants better than else anyone did. During this time, they focused their energies on finding every plant that grew in the county. Collectively, they filled the herbarium in the Douglas County Museum with pressed specimens of more than 3,000 plants.

Their great partnership started in the early 1960s over an orchid. Lois Wesley Hopkins, a first grade teacher, learned that Mildred Thiele, a second grade teacher, thought a coral root was a member of the heath family. Lois knew a little bit about botany at that time, and had recently taken a class in natural history just to have something extra to share with her students. Also, in 1960, the late George Abdill, former director of the Douglas County Museum talked Lois into working on a herbarium project for the museum. Lois remembered his request was simple,—he wanted a sample of every plant that grew in Douglas County.

When Lois began the herbarium project she knew she had to have help. After letting Mildred know that the coral root was in the orchid family, she asked Mildred if she'd care to join her in the herbarium project. It was then they discovered a mutual interest in a new-found love of wildflower identification. "I was already doing art work in watercolors and illustrating the plants seemed like something I'd enjoy," Mildred said. "I grew up in Tyee and marveled at the many wild plants in the woods, but I never got into the scientific part until I got together with Lois."

When Lois and Mildred met Joan Fosback at the Glide Wildflower Show in 1967, they became a team of three. Joan became interested in botany as a child in Medford. Her mother and maternal grandmother were crazy about gardening and Joan took a great interest in plants and being outdoors. She and her husband Ollie moved to Roseburg in 1947. Ollie gave her a simple wildflower book, which led to a lifetime of learning about plants, including volunteering at the Glide Wildflower Show.

The three ladies immersed themselves in the wild, week-long frenzy of plant gathering that precedes the show each year. They scoured hillsides, forests, meadows, cliffs, and shores to find plants to take back to the show and carefully identify. Fortified with the ladies' extra energy, the Glide Wildflower Show grew from a very modest collection of locally collected plants to an extravaganza of hundreds of correctly identified plants all neatly arranged by family. As Joan became more and more interested in native plants, she acquired a microscope, a set of botany textbooks, and a plant press. She was seldom seen without a flora and plant press during family vacations, on summer botany surveys with Mildred and Lois, and collecting for the Glide Wildflower Show.

In 1977 the "Little Old Ladies in Hiking Boots" crew was delighted with a new challenge: the Bureau of Land Management (BLM) contracted with them to compile a *Para-Botanist Training Package*. This comprehensive report became the first botanical report of the BLM Roseburg District. The group continued to develop a Douglas County plant checklist indicating which plants might be considered "threatened or endangered."

Mary Carlson moved to Roseburg in 1979 and met the three other ladies in 1982. She was a city girl, born in San Francisco, with a keen sense of adventure. She and her twin sister climbed Mt. Rainier when they were 12 years old (setting a record for youngest climbers at the time). She earned a private pilot's license while studying for a degree in microbiology at Stanford University. "I knew nothing about plants," she said. "In my freshman year at college, I took botany, but I have learned everything I know from this group."

Left to right: Mildred Thiele, Lois Hopkins, Mary Carlson, and Joan Fosback. Photo by Amiran White, courtesy of The News-Review, Roseburg.

In 1980, the group was invited to house their private botanical collection at the Douglas County museum and to establish a scientific herbarium. The Friends of the Museum generously supplied cabinets, dissecting microscopes, scientific books and various supplies. Dr. David Wagner and Dr. Kenneth Chambers gave valuable suggestions to the three ladies. Collecting and mounting plant specimens moved them to the next level. Soon they needed a more workable system for recording plant lists and accessions to the herbarium. Mary's contributions to the group included her knowledge of Latin and computer skills. In the summer of 1987, Lois Hopkins asked Mary to baby-sit her computer and by summer's end, Mary had entered all the collections in a computerized plant database!

In 1993, they completed a 53-page book documenting their collections, sorted by family, from Aceraceae to Zygophyllaceae–plants from every nook and cranny of the county. They admitted they hadn't yet found all of the plant taxa growing in Douglas County, but they certainly hadn't given up searching. In 1997, the group, still actively botanizing, found western wahoo (*Euonymus occidentalis*), a common shrub in California but not previously recorded in Douglas County.

Although the four modestly described themselves as the "Little Old Ladies in Hiking Boots," it would be a mistake to underestimate their audacity and tenacity. They didn't sit around waiting for others bring plants in for identification. As hands-on researchers who combed every corner of the county looking for plant specimens, they had more than a few stories to tell about their wild adventures.

Mildred said she once fell into a "real pothole" while walking in the woods in search of plants. The hole was the leavings of a marijuana grower who had been growing his illicit plants in a large bucket. "We figure the grower must have pulled up the bucket and left the hole," she said. Mary said once she was so busy looking at a plant she walked right off a cliff. Lois ventured out on some mossy ground, only to find herself up to her neck in a bog. "I can't tell you how many tires we've changed," Mildred said, and noted that her husband was not too happy about her ruining a dual muffler on her car during a single outing (punctured by two separate rocks in the road). A variety of challenges were overcome: what to do when a tree fell across the road, trapping them at the dead-end; how to break the car window after locking the keys inside; or getting lost (who moved that creek because it was not there on the map?). They also remembered driving through an open gate in a mountainous area and upon returning, found the gate closed and locked. On another adventure, they almost got stuck on a narrow logging road miles from civilization in a sudden snow storm.

All four admitted to botanizing whenever and wherever they traveled. "You just can't help yourself," Joan said. The four met every Tuesday to process and identify their plant specimens. In the winter, they mounted and labeled the pressed plants and wrote the history of the finds made during spring, summer, and fall field work. In 1995, they published a book, *Flora Distribution Survey for Douglas County,* based on their field work from 1978 to 1993. When their work was incorporated into the Oregon Atlas Project (Oregon Flora Project), it became apparent that their contributions put Douglas County far ahead of other counties in cataloging the native flora.

In the late 1990s, the four admitted that age was a problem. Because they knew that someone had to eventually take over their work, they openly sought new recruits interested in "making a lasting worthwhile contribution to the botanical study of Douglas County."

Lois Wesley Hopkins, who turned a coral root question into a lifetime of botanical adventures, died on December 6, 2005, at the age of 94. The Glide Wildflower Show and the Douglas County Museum were very important parts of her life. Mildred Thiele was 91 when she died September 10, 2006. She was "still going strong" at the age of 90 when she donated nearly 5,000 color slides to OSU for the Oregon Flora Project. She had carried two cameras on her field excursions since 1982 and presented programs of her wildflower adventures to many organizations. In addition, she was an outstanding artist and especially proficient in watercolors. Mary Carlson so loved identifying plants that she could still identify most of them by touch after she lost her vision. She died on March 3, 2007 at the age of 86. Joan Fosback, now approaching 80, was unable to attend the 2007 NPSO annual meeting in Mosier. Members of the Umpqua Chapter will present the award to her in her home in Roseburg.—*Sam Friedman, Umpqua Chapter*, adapted from the Oregon Flora Newsletter and a News Review article by Bill Duncan.

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Book Reviews

Common Plants of the Upper Klamath Basin

Sarah Malaby, editor. 2007. 272 pages. 464 color photographs, map, indices to scientific and common names. No ISBN. Oregon Native Plant Society, Klamath Basin Chapter and Rabe Consulting, paper.

This excellent guide pictures and describes 464 of the plants found in the varied habitats of Klamath County and adjacent areas east of the Cascade Range in southern Oregon and northern California. The Upper Klamath Basin, defined as the area drained by the Klamath River upstream from Copco Lake, ranges from an elevation of 2,600 feet at Copco Lake to the 9,495 foot summit of Mt. McLoughlin and includes Crater Lake National Park (the remnant caldera of Mt. Mazama) and Lava Beds National Monument. Both testify to the volcanic origins of the basin. Soils and habitats range from expanses of droughty pumice deposited by volcanic eruptions to the rich alluvial soils around the extensive marshes and lakes, from alpine to agricultural, from dense conifer forests to scattered juniper scablands, and from rocky outcrops to alkaline flats.

Common Plants of the Upper Klamath Basin is a remarkably helpful guide to the vegetation of this large and varied region, designed for the general user, though the plants are listed alphabetically by family rather than by flower color as in some popular guides. Each plant is given a half-page which includes family name, scientific name, common name, and a color photo. Text describes the plant's characteristics in lay-man's terms, (none requiring even a hand lens), and measurements are given in inches. A brief description of habitat is followed by a readable short paragraph called "Notes" which might include information on how to tell the plant from look-alikes, or where exactly to look for it, or information about its rarity or its use and toxicity. The book includes a few tantalizing teaser examples of ferns, horsetails, grasses, lichens, mosses, and blue-green algae (including Mare's Eggs, a colonial blue-green alga that forms leathery baseball-looking clumps in a several cold, clear springs around the basin). These teasers are a fine way to lure us flower-besotted users into an

awareness of other plant and life forms.

In addition to the plant descriptions, brief features include an overview of the basin and a description of its habitats, a description of each plant family, a history of plant exploration in the area, and information on glowing native plants.

The cover photo (by Ron Larson) features Applegate's paintbrush, found by Elmer Applegate on Mount Scott in Crater Lake National Park, one of a number of species in the area first reported by him.

The photographs, by Michael Calonje, Ron Larson, Sarah Malaby, and Terry Spivey, are the heart of the book and are excellent and remarkably informative. Indeed, this enticing book has been difficult to write about because the photographs and notes kept snagging me to read further, discovering old friends and learning new and intriguing bits of information about each. The writing, and indeed the entire book, is straightforward, accessible and useful, a fine model for other such books.

–Connie Battaile, Siskiyou Chapter

Rare Plants of Southwest Oregon

by Linda Mullens and Rachel Showalter. 2007. 298 pages, illustrations, color photographs, bibliographic references and index. Medford District BLM and Rogue River-Siskiyou National Forest, Grants Pass Interagency Office, paper. $15.

The most useful guide to identify much of the flora of southwestern Oregon is The Jepson Manual Higher Plants of California. This is because many Californian species reach their northern distribution limits in the region which is the northern periphery of the so-called California Floristic Province. The Jepson Manual has had to serve Oregon botanists because the floras and field guides to plants of the Northwest neglected the southwestern portion of the state, except for Peck's classic Manual of the Higher Plants of Oregon, last printed in 1961, and now very much out-of-date. However, in the last two years, botanists and amateurs in the area have been cheered by the publication of three plant guides including Kozloff's "Plants of Western Oregon, Washington & British Columbia," Turner and Gustafson's "Wildflowers of the Pacific Northwest" and Kemper's "Wildflowers of Southern Oregon." Though the former two books deal with the entire Northwest, they include many species from southwestern Oregon. Kemper's guide describes briefly nearly 700 species from the region. And now a fourth guide has appeared: "Rare Plants of Southwest Oregon," by Linda Mullens and Rachel Showalter. What information does it present and how should it be regarded?

The new guide is modeled closely on a previous field guide, "Selected Rare Plants of Northern California," written by federal and state botanists and edited by G. Nakamura and J.K. Nelson, published in 2001 by the University of California Press. The formats of the two guides are nearly identical: similar size, ring-bound, each species on a pair of facing pages, brief descriptions of morphology and how to distinguish the species from similar ones, full-color photos, line drawings and a map showing distributions. The Mullens-Showalter book describes 142 taxa that grow in Jackson, Josephine, the eastern 3/4s of Curry and the southern edge of Douglas counties. The Nakamura-Nelson book describes 149 taxa found in the northern ten counties of California. The plants described in the Mullens-Showalter book are listed on ORNHIC Lists 1 and 2 (and have more or less equivalent status on BLM and/or FS lists). Those described in Nakamura-Nelson are mostly on CNPS List 1B. Sixteen taxa are common to both.

Of the 142 plant taxa described in Mullens-Showalter, 112 also grow in California with many common and widespread there. Only 26, including two known only from single collections and now thought extinct, are endemic to southwestern Oregon. (Completing the list are four other taxa that also grow in Washington, Idaho and elsewhere.) According to the Foreward, written by the Medford District Botanist, the species in the guide were chosen by the sponsoring federal agencies because they are on or proposed for inclusion on their "Sensitive" or "Special Status" lists.

Many species described in the guide are odd choices since they are widespread in adjacent and/or more distant states yet are not likely to be encountered in southwestern Oregon; examples include the microscopic, floating duckweed *Wolffia columbiana* found widely in North America, four of the nine included *Carex* species, the sedge *Scirpus subterminalis*, the swordfern *Polystichum californicum*, the pillwort *Pitularia americana*, and the adder's tongue *Ophioglossum pusillum*. Also odd choices are four species thought extinct in Oregon. In contrast, a number of included species are not rare though their distributions in the region are restricted: examples include *Arctostaphylos hispidula*, *Bensoniella oregana*, *Clarkia heterandra*, *Limnanthes gracilis* var. *gracilis*, and many serpentine endemics in the Illinois Valley.

Overall, the new guide book was designed "to help botanists working for federal agencies and their partners" identify species placed on federal and state lists. Thus, inclusion of many of the species may reflect certain legal concerns that require these species to be monitored. But amateur botanists and plant lovers often have other interests. So should they buy the new guide book? The botanical information therein is useful and convenient, and the color photos and line drawings are generally excellent. The Mullens-Showalter guide, especially when considered together with the Nakamura-Nelson guide, offers a valuable introduction to the many rare and interesting plant species that grow in the northern portion of the California Floristic Province. Their similar and efficient organization, particularly the ease of comparing plant distributions both within and among species, will be helpful to plan hikes and to think about how and why plant taxa grow where they do. But, unfortunately, like most other field guides, neither has much to say about the biology of the species: how they adapt to local habitats, how they are pollinated, if they are rare because they originated recently or because their habitats were degraded by human action or other causes.

–Leslie Gottlieb, Siskiyou Chapter

Introduction to California soils and plants: serpentine, vernal pools, and other geobotanical wonders

by A. R. Kruckeberg. 2006. California natural history guides 86. University of California Press, Berkeley (CA). 280 p. $45.00 hardcover $18.95 paperback

Why would an Oregon botanist be interested in this book? Any botanist should be interested in Professor Kruckeberg's lucid, well-illustrated account of why plants grow and evolve where they

do as influenced by topography, geology, hydrology, and soils and their mineral constituents. How geology shapes plant life in the landscape is the focus of this book, using California's diverse geology and landforms as the example. Mount Whitney, the highest point in the contiguous United States at 14, 505 ft. is only 80 miles from Death Valley the lowest point in North America at -282 ft. Then there are the 6,000 or so vascular plant taxa, the book's other focus, that occupy habitats from coldest cold in alpine areas to hottest hot in deserts from soggy coastal rainforests to dry high desert steppes.

There are chapters on landforms and plant life, plants and their soils, serpentine soils (a Kruckeberg favorite), other strange plant-soil relationships (limestone, salt flats, bogs and fens to guano habitats), plant distribution over space and time (endemics, indicator species of soil types), and human influences (mining and exotic species) to add just a few of the examples. Excellent color photographs of plants and landscapes illustrate each chapter. Brief, easy to read tables summarize details, maps show places of interest, and diagrams illustrate complex concepts.

After the epilog there is "Exploring California's Geology and Plant Life" with maps and a list of places to go to visit "exceptional sites" that show how geobotany influences the state's plant life. The map on page 236, Unique California Soil Types, shows Mount Eddy east of Interstate 5, not west, a minor "oops" in such a wonderful book.

So why should an Oregon botanist buy Kruckeberg's book? Many Oregon soils and landforms are the same or similar, often with the same or different species and just as perplexing. Kruckeberg's book will help answer many geobotanical questions posed by Oregon's diverse landscape and rich flora.

(Dr. Arthur Kruckeberg was Dr Frank Lang's Major Professor for his Master of Science Degree in Botany at the University of Washington. The inscription in Lang's copy of the book reviewed here reads, "To Frank Lang, fellow naturalist and old friend. Art Kruckeberg." Lang is indebted and grateful for Kruckeberg's mentorship, tutelage, and teaching him the meaning of ubiquitous.)

–Frank Lang, Siskiyou Chapter

Pitcher Plants of the Americas

by Stewart McPherson. 2006. vii + 320 pages, 227 color photographs, 12 maps and drawings, glossary, metric:imperial conversion table, bibliography, index. McDonald & Woodward Publishing Company. ISBN 0-939923-75-0, $44.95, hardcover; 0-939923-74-2, $34.95, softcover.

This is an absolutely beautiful book, crammed full of exquisite color images reproduced with excellent resolution. All you have to do is let it fall open in your hands and you'll say, "I want it!" The pitcher plants are the spectacular stars of carnivorous plants. This book focuses on that element of beauty so it stands out from other books about carnivorous plants. My greatest wonder came from the depiction of the diversity of the genus *Heliamphora* in South America. I had never imagined such variation of leaf form and color among species of this South American endemic genus. Also intriguing is the inclusion of three species in two other South American genera of the Bromeliaceae, *Brocchinia* (two species) and *Catopsis* (one species). These are "tank bromeliads" which trap insects in water at the base of a tubular whorl of leaves. I would not have thought, myself, to have included them in a book of pitcher plants but their presence in the same habitats as *Heliamphora* and their photogenic character make them seem not so out of place here. Otherwise, the three genera of the traditional pitcher plant family, Sarraceniaceae, are treated in detail.

The author is young, only twenty-three when the book was published. He claims that he resolved at the age of sixteen to write a book about pitcher plants before turning twenty two. Getting the book published within a year after that is remarkable. His travels to study and photograph these plants embody the great tradition of English explorerers. At the same time he obtained a BS in geography from the University of Durham. That this is a *jungendwerk* is probably the source of the few nits I have to pick.

Some peculiarities are the responsibility of the publishing company. They did not edit the book for American audiences, as evidenced by spellings such as "colour." It is the publisher's claim that the book is "technically written" that makes me critical. I find evidence of inadequate editorial oversight for this claim. McPherson frequently cites a combining reference as the "original description." For example, for *Sarracenia purpurea* ssp. *venosa* (Rafinesque) Wherry, he cites Wherry, 1933, as the original description. Wherry is responsible for treating this taxon as a subspecies but the original description was as a species by Rafinesque in 1840 (Cheek *et al.* 1997, Taxon 46:781-783). There are a few other discrepancies between technical terminology and usage by McPherson that indicate the author is a geographer first, a taxonomist second.

Further reservation regarding technical quality comes from the lack of attention to standard botanical literature. McPherson's interest in these plants as an amateur and horticulturalist is evident from the abundance of citations from the "Carnivorous Plant Newletter" and paucity of citations from professional journals. An example is the absence of mention of *Sarracenia rosea*, which was described as a distinct species eight years ago (Naczi *et al.* 1999, Sida 18:1183-1206). A web search quickly turns up this taxon, discussed in both the professional literature (Ellison *et al.* 2004, Am. J. Bot. 91:1930-1935) and on popular carnivorous plants web sites. Similarly, McPherson speculates on the evolutionary relationships among the genera of the Sarraceniaceae, supporting a model based on his personal views of what is morphologically advanced, without referring to contemporary studies using molecular techniques (Albert *et al.* 1992, Science 257:1491-1495). His views are interesting but not supported by these recent studies.

Closer to home, it is hard to ignore the strange distribution map for *Darlingtonia,* which shows a large spot in north central Oregon that would have to be somewhere between the Ochoco and Cascade Mountains. I wonder where that idea came from?

In conclusion, this is a beautiful book and it is a good book but it's not a great book. If what is desired is an overview of the colorful forms of these plants and the habitats in which they occur, this book will satisfy. If a technical understanding is desired, supplemental literature will be needed.

–David Wagner, Emerald Chapter